FISHERY RESEARCH

IDAHO NATURAL PRODUCTION MONITORING AND EVALUATION

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Idaho Natural Production Monitoring and Evaluation

Project Progress Report

2009 and 2010 Combined Annual Report

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ABBREVIATIONS AND ACRONYMS

BPA	Bonneville Power Administration
BY	Brood Year
CI	Confidence Interval
COE	U.S. Army Corps of Engineers
CWT	Coded Wire Tag
EFSF	East Fork South Fork Salmon River
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FANR	Females Available for Natural Reproduction
FL	Fork Length
GPM	General Parr Monitoring
GSI	Genetic Stock Identification
HOR	Hatchery Origin
ICBTRT	Interior Columbia Basin Technical Recovery Team
IDFG	Idaho Department of Fish and Game
INPMEP	Idaho Natural Production Monitoring and Evaluation Project
ISMES	Idaho Steelhead Monitoring and Evaluation Studies
LGR	Lower Granite Dam
MPG	Major Population Group
NOAA	National Oceanic and Atmospheric Administration
NOR	Natural Origin
NWFSC	Northwest Fisheries Science Center
ODFW	Oregon Department of Fish and Wildlife
PIT	Passive Integrated Transponder
RPA	Reasonable and Prudent Alternatives
SAR	Smolt to Adult Return Rate
VSP	Viable Salmonid Population

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ABSTRACT

The goal of the Idaho Natural Production Monitoring and Evaluation Project (INPMEP) is to monitor and evaluate the status of wild Snake River spring-summer Chinook salmon and summer steelhead populations in the Salmon and Clearwater river subbasins. The INPMEP project is in the process of expanding and adapting. Several events prompted these changes: 1) completion of the 2007-2009 funding cycle and the proposal process for continued funding; 2) development of a regional research, monitoring, and evaluation strategy; and 3) the Endangered Species Act status review for anadromous salmonids on the West Coast. In this report we summarize INPMEP activities for contract years 2009 and 2010. We summarize redd surveys for Idaho trend transects for both years. We also aged 1,010 Chinook salmon carcasses from the Salmon and Clearwater river subbasins in 2009 and 1,366 carcasses in 2010. Over the course of these two years, we observed an increase in the Chinook salmon smolt-to-adult return rate from 1.77% for smolt year 2007 to 3.31% for smolt year 2008, although neither cohort's returns are complete. We added two years to our Chinook salmon stock-recruit curve (r^2 = 0.938, n = 19) which predicts that production will exceed one million smolts during 2011 and 2012. Also during 2009 and 2010, INPMEP snorkel crews surveyed 486 and 392 sites, respectively, to help describe Chinook salmon and steelhead juvenile density, productivity, and spatial structure.

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INTRODUCTION

Populations of Chinook salmon *Oncorhynchus tshawytscha* and steelhead trout *O. mykiss* in the Snake River basin declined substantially following the construction of hydroelectric dams in the Snake and Columbia rivers. Raymond (1988) documented a decrease in survival of emigrating steelhead trout and Chinook salmon from the Snake River following the construction of dams on the lower Snake River during the late 1960s and early 1970s. Abundance rebounded slightly in the early 1980s, but then escapements over Lower Granite Dam (LGR) into the Snake River basin declined again (Busby et al. 1996). In recent years, abundances in the Snake River basin have slightly increased. The increase has been dominated by hatchery fish, while the returns of naturally produced Chinook salmon and steelhead remain critically low. As a result, Snake River spring-summer Chinook salmon (hereafter Chinook salmon) were classified as threatened in 1992 under the Endangered Species Act (ESA). Within the Snake River spring-summer Chinook salmon evolutionarily significant unit (ESU), there are seven major population groups (MPGs): Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, Upper Salmon River, Dry Clearwater, and the Wet Clearwater (ICBTRT 2003, 2005; NMFS 2011). However, the Dry Clearwater and the Wet Clearwater MPGs are considered to be extirpated. A total of 29 extant demographically independent populations have been identified. Snake River steelhead trout (hereafter steelhead) were classified as threatened under the ESA in 1997. Within the Snake River steelhead distinct population segment, there are six MPGs: Lower Snake River, Grande Ronde River, Imnaha River, Clearwater River, Salmon River, and Hells Canyon Tributaries (ICBTRT 2003, 2005; NMFS 2011). However, the Hells Canyon MPG is considered to be extirpated. A total of 24 extant demographically independent populations have been identified.

Anadromous fish management programs in the Snake River basin include large-scale hatchery programs – intended to mitigate for the impacts of hydroelectric dam construction and operation in the basin – and recovery planning and implementation efforts aimed at recovering ESA-listed wild salmon and steelhead stocks. The Idaho Department of Fish and Game's (IDFG) long-range goal of its anadromous fish program, consistent with basinwide mitigation and recovery programs, is to preserve Idaho's salmon and steelhead runs and recover them to provide benefit to all users (IDFG 2007). Management to achieve these goals requires an understanding of how salmonid populations function as well as regular status assessments (McElhany et al. 2000). However, specific data on Snake River steelhead and Chinook salmon populations are lacking, particularly key parameters such as population abundance, age composition, genetic diversity, recruits per spawner, and survival rates (ICBTRT 2003). The key metrics to assessing viability of salmonid populations are abundance, productivity, spatial structure, and diversity (McElhany et al. 2000).

The aggregate escapement of Snake River steelhead and Chinook salmon is measured at LGR, with the exception of the Tucannon River, Washington, population. Some of the wild fish are headed to Washington or Oregon tributaries to spawn, but the majority is destined for Idaho. Age, sex, and stock composition data are important for monitoring recovery of wild fish for both species. Age data collected at LGR are used to assign returning adults to specific brood years (BYs), for cohort analysis, and to estimate productivity and survival rates (Copeland et al. 2007; Copeland et al. 2009). In addition, escapement estimates by cohort are used to forecast run sizes in subsequent years, and these forecasts are the basis for preliminary fisheries management plans in the Columbia River basin. In the 1950s, IDFG developed a program to index annual spawning escapement by enumerating Chinook salmon redds in selected areas. Currently, the total area and number of streams surveyed represents a large portion of wild Chinook salmon spawning habitat (Hassemer 1993a). The number of redds counted in these areas provide an index of the annual wild adult Chinook salmon spawner abundance at the independent population scale.

Information presented in this report is summarized according to the viable salmonid population (VSP) criteria mentioned above. In the past, Idaho Natural Production Research Monitoring and Evaluation Project (INPMEP) has monitored the Idaho portion of the Snake River spring-summer Chinook salmon ESU (hereafter the aggregate) above LGR. Some historical, large-scale analyses remain informative (e.g. stock-recruit model), and we will continue with these methods unchanged from past reports. However, from this report forward, the reporting format will reflect VSP monitoring; the scale of the data reported will be population-specific where possible, and the types of data reported may differ from past reports. Population-specific redd survey data is included here, which differs from previous reports. Redd survey data were added in the 2010 proposal to address the Reasonable and Prudent Alternatives (RPAs) 50 and 63, defined in the 2008 Federal Columbia River Power System Biological Opinion. We address RPA 50 to produce data relevant to Chinook salmon and steelhead population status assessments and will also provide data on hatchery Chinook salmon carcasses found on the spawning grounds. Fraction of hatchery Chinook salmon contributing to natural spawning is relevant to RPA 63.

The purpose of the INPMEP is to provide information for monitoring the status of Idaho's wild Chinook salmon and steelhead populations with respect to the VSP criteria and how status is trending over time. For Chinook salmon, 2009 and 2010 data were collected in selected spawning tributaries in the Clearwater and Salmon river subbasins to describe population-specific abundance, productivity, spatial structure, and diversity. We also sampled wild (unmarked) adult Chinook salmon at LGR in 2009 and 2010, which is summarized in separate reports (Schrader et al. 2011; Schrader et al., in preparation). Here, we provide an abridged version of aggregate Chinook salmon age composition for estimating smolt-to-adult survival return rates. For Chinook salmon and steelhead, we assess spatial structure and productivity of juveniles during 2009 and 2010.

OBJECTIVES

Project tasks are grouped into four objectives. The purpose of each objective involves enumerating or describing individuals within the various life stages of wild Chinook salmon and steelhead. By understanding the transitions between life stages and associated controlling factors, we hope to achieve a mechanistic understanding of stock-specific population dynamics that will aide mitigation and population recovery efforts.

Objective 1. Estimate 2009 and 2010 adult abundance and composition of returning wild adult Chinook salmon passing LGR. In collaboration with the Chinook and Steelhead Genotyping for Genetic Stock Identification (GSI) at Lower Granite Dam (GSI; Bonneville Power Administration [BPA] project #2010-026-00), we will decompose the aggregate estimates into major population groups and, in some cases, populations. Over time, productivity will be assessed. These results will be reported in a separate document.

Objective 2. Estimate population-specific abundance, hatchery fraction, and composition of wild Chinook salmon from information obtained on the spawning grounds in the Salmon River and Clearwater River subbasins.

Objective 3. Estimate the distribution and abundance of wild Chinook salmon and steelhead parr in tributaries of the Salmon River and Clearwater River subbasins in coordination with the Idaho Steelhead Monitoring and Evaluation Studies (ISMES; BPA project #1990-055-00). Estimate spatial structure and productivity.

Objective 4. Estimate life cycle survival and the freshwater productivity of the Snake River Chinook salmon ESU. There are two components: update and refine a stock-recruit model, and estimate aggregate smolt-to-adult survival rates.

METHODS

Wild Chinook Salmon Adult Abundance

2009 and 2010 Redd Surveys

During 2009 and 2010, redd survey methods were the same. Transect boundaries and survey dates have generally remained constant and were described in Hassemer (1993a). Standardized procedures for Chinook salmon redd surveys are described in Hassemer (1993b). Single-pass, peak-count surveys are made over each trend area each year. Each survey was originally timed to coincide with the period of maximum spawning activity on a particular stream, based on historic observations. Then each transect was assigned a target count-time window. The method chosen for each redd survey was made depending on the best visual technique for each trend area and to maximize the number of river miles surveyed. Methods include low-flying helicopter or single-pass ground surveys conducted on foot.

Several transects were not surveyed during 2010 due to a helicopter accident. All aerial surveys were subsequently cancelled and many trend transects were counted from the ground instead. Only the ground surveys in trend transects that were surveyed in the historical time frame and boundaries were used to supplement aerial surveys.

These data were used by the Interior Columbia Basin Technical Recovery Team (ICBTRT) to estimate adult spawner abundance by expanding the number of redds counted in the trend transects to the extent of the available spawning habitat, the estimated number of fish/redd, and by multiplying by the sex ratios to determine the number of males (ICBTRT 2007). For this report, the peak trend survey count data will be reported for 2009 and 2010. These data will be used in subsequent reports to build trends of adult spawner abundance by population.

Wild Chinook Salmon Carcass Surveys and Age Composition

2009 and 2010 Carcass Surveys

During 2009 and 2010, carcass survey techniques remained the same and were identical to past methods (Copeland et al. 2004). Field personnel sampled carcasses from spawning areas throughout the Idaho portion of the study area (Figures 1 and 2). In general, these reaches were a subset of the redd survey transects described in Hassemer (1993a).

Hatchery personnel also collected dorsal fins from known-age (Passive Integrated Transponder [PIT] or Coded Wire Tagged [CWT]) hatchery adults at Rapid River, Sawtooth, Clearwater, Pahsimeroi, and McCall hatcheries. The known-age samples were collected from Chinook salmon tagged as juveniles with PIT tags or CWTs and recovered as returning adults.

The known-age samples were used to estimate aging accuracy and to train new personnel in growth patterns specific to the years being analyzed.

2009 and 2010 Carcass Age Composition

Fin ray analysis techniques remained the same during 2009 and 2010 and were consistent with past techniques (see Copeland et al. 2007 for a full description). Fin rays were dried, set in epoxy resin, cut into cross-sections with a bone saw, and mounted on microscope slides. All samples were aged independently by two technicians. Personnel were trained with reference fin rays and were required to demonstrate 90% accuracy in a test before they were allowed to begin aging new samples.

Fins were aged again in a referee session if there was disagreement in age determination or if the age did not match what was expected for fish length. In a referee session, three personnel viewed the fin together and arrived at a consensus age. In some cases, a consensus could not be achieved and the fin ray was removed from the sample. Known-age samples were randomly included with the wild samples to assess accuracy. Chinook salmon with a fork length (FL) less than 45 cm were removed from the sample due to the possibility that they were mini-jacks.

We summarized carcass survey data in four ways. The length-frequency distribution determined by fin ray analysis was plotted separately for 2009 and 2010 to describe the aggregate population above LGR. The number of carcasses collected was summarized by age for each population for each year. Lastly, frequencies of hatchery origin (HOR) and natural origin (NOR) carcasses were summed between the BioSamples and the Spawning Ground Survey database for each independent population and MPG.

Wild Chinook Salmon Smolt-To-Adult Survival Rate

To estimate the aggregate smolt-to-adult survival rate for wild Chinook salmon, we combined the age assignments of adults, obtained from scale analysis at LGR, with estimates of emigrating wild Chinook salmon smolts at LGR from the Fish Passage Center (www.fpc.org). Abundance by cohort for the 2009 and 2010 returns was obtained from the LGR reports (Schrader et al. 2011; Schrader et al., in preparation). To calculate a smolt to adult return rate (SAR) for a particular smolt year, we used the sum of ocean returns from that cohort as the numerator and the estimate of wild smolts arriving at LGR as the denominator:

$$SAR_k = \frac{\sum_{l-1}^{4} r_{k+l}}{S_k},$$

where SAR_k is the smolt-to-adult return rate of smolt year k, r_{k+l} is the return from that cohort in year $k + l$, l is ocean age, and S_k is the estimate of smolts migrating in year k. The maximum value of l is four because that is the maximum ocean age observed for Chinook salmon at LGR (Copeland et al. 2004). We used formulas from Fleiss (1981) to estimate the 95% confidence limits on SAR values. The lower limit is given by

$$\frac{\left(2np + t_{\propto/2}^2 - 1\right) - t_{\propto/2}\sqrt{t_{\propto/2}^2 - (2 + 1/n) + 4p(nq + 1)}}{2\left(n + t_{\propto/2}^2\right)},$$

and the upper limit by

$$\frac{\left(2np + t_{\propto/2}^2 + 1\right) + t_{\propto/2}\sqrt{t_{\propto/2}^2 + (2 + 1/n) + 4p(nq + 1)}}{2\left(n + t_{\propto/2}^2\right)},$$

where n is the number of smolts, p is the SAR value as a proportion, q is 1-SAR, and $t_{\propto/2}$ is 1.96.

Wild Chinook Salmon Intrinsic Population Productivity

Females Available for Natural Reproduction

Intrinsic population productivity is estimated using a stock-recruit model. We did this for the aggregate population by relating the abundance of emigrating smolts at LGR to the number of female parents on the spawning grounds. The number of Chinook salmon females available for natural reproduction (FANR) upstream of LGR was estimated using methods consistent with Copeland et al. (2009). The estimated number of adults per run type (excluding jacks) passing LGR during 2009 and 2010 was obtained directly from the Fish Passage Center website (www.fpc.org, obtained March 2011). At Columbia River dams, U.S. Army Corps of Engineers (COE) designates jack Chinook salmon as fish between 30 and 56 cm in length at the counting window. Adult Chinook salmon that pass LGR between March 3 and June 17 are defined as "spring run," and those passing LGR between June 18 and August 17 are defined as "summer run." The total number of adult Chinook salmon (excluding jacks) captured at hatchery traps and the number of females taken into hatcheries was obtained from unpublished IDFG hatchery reports, the IDFG hatchery database, the Oregon Department of Fish & Wildlife (ODFW; Joseph Feldhaus, personal communication), and the U.S. Fish & Wildlife Service (Howard Burge, personal communication). McCall and Pahsimeroi hatchery fish are considered summer run and all other hatchery stocks are spring run. The percentage of females, by run type, was estimated for all adult Chinook salmon identified to sex at hatchery weirs. The estimated percentage of females was applied to the aggregate LGR counts for each run type to estimate the total number of female Chinook salmon passing LGR. The total harvest estimates upstream of LGR were obtained from IDFG (Alan Byrne, personal communication), Nez Perce Tribe (Joe Oatman, personal communication), Shoshone-Bannock Tribes (Scott Brandt, personal communication), and ODFW (Joseph Feldhaus, personal communication). Female harvest was estimated by multiplying run-specific total harvest by the respective sex ratio. To estimate the FANR, the adjusted hatchery female number and the adjusted number of females harvested upstream of LGR were subtracted from the estimated number of females passing LGR. Spring and summer FANR estimates were combined to estimate total FANR.

Stock-Recruit Model

Smolt production in 2009 and 2010 was estimated using daily counts of wild smolts at LGR and estimated daily collection efficiencies (probability of detection at the dam). The total daily wild Chinook salmon smolt migration number was estimated by dividing the daily count of wild smolts by the estimated collection efficiency for that day. The daily counts of wild Chinook salmon smolts at LGR were obtained from the Fish Passage Center website (www.fpc.org, accessed March 2011). The estimated daily smolt collection efficiencies were obtained from the Northwest Fisheries Science Center (NWFSC; Steve Smith, personal communication). Efficiencies were estimated by NWFSC personnel using procedures detailed in Sandford and Smith (2002). Daily abundance estimates were summed for the year.

A Beverton-Holt function was used for this analysis. Previous work showed the Beverton-Holt function yielded a better model fit than the Ricker function (Copeland et al. 2004). Copeland et al. (2009) estimated the FANR for BY 1990-2008 and the number of smolts produced by BYs 1990-2008. The smolt estimate from the 2009 and 2010 migration (BY2007 and 2008) was added to these data. The stock-recruit model was refit using the Beverton-Holt formula (Ricker 1975).

$$R = \frac{1}{\alpha + \beta / P},$$

where P = parent year spawning escapement (i.e. FANR), R = recruits (smolts) produced by parent year spawning escapement (P), and α and β are fitted parameters representing the slope at the origin and the asymptote. In this formulation, α is the inverse of asymptotic production and β is the inverse of slope at the origin (Quinn and Deriso 1999). Model parameters were estimated using iterative nonlinear regression (Gauss-Newton algorithm).

Wild Chinook Salmon and Steelhead Juvenile Density and Spatial Structure

We used a rotating panel design (Larsen et al. 2001) to select from previously established snorkeling transects focusing on three objectives: 1) to conduct extensive surveys to assess parr distribution and abundance at the population scale (see ICBTRT 2003 for population delineations); 2) to conduct intensive surveys to calibrate parr densities with production of juvenile emigrants estimated from screw traps in target drainages; and 3) to conduct surveys at core and non-core trend transects to maintain the long-term juvenile-to-juvenile productivity data series for steelhead. For the first two objectives, transect selection was based on a generalized random-tessellation stratification, which is designed to be a spatially-balanced probabilistic selection from all potential transects (Stevens and Olsen 2004). For the third objective, transects were selected from previously established trend transects on a two-year rotating panel.

2009 and 2010 Extensive Panel Surveys

Extensive panel surveys are conducted with a lesser frequency, to assess salmonid distribution at the landscape scale. Extensive panel drainages were chosen based the data needs for steelhead spawning aggregates as defined by the ICBTRT. For the extensive panel in 2009, we chose the Selway River, North Fork Salmon River, Slate Creek (lower Salmon River tributary), and Potlatch River. For the North Fork Salmon River survey, we included the tributaries to the Salmon River between the North Fork and Panther Creek to cover the North Fork Salmon River steelhead population as delineated by the ICBTRT (ICBTRT 2003).

For the extensive panel in 2010, we chose the middle Selway River, Big Creek, Panther Creek, and the Potlatch River. For the Panther Creek survey, we included the tributaries to the Salmon River between Panther Creek and Chamberlain Creek, excluding Chamberlain Creek and the Middle Fork Salmon drainage, to cover the Panther Creek steelhead population as delineated by the ICBTRT (ICBTRT 2003). The Selway River was divided into thirds, the lower portion (downstream of Marten Creek) was surveyed during 2009, and the middle portion (downstream of Bear Creek to and including Marten Creek) was surveyed during 2010. Because of logistical reasons, only the southern half of the Panther Creek drainage was surveyed during 2010, including one of the Salmon River tributaries. The remainder of Panther Creek will be surveyed during 2011.

2009 and 2010 Intensive Panel Surveys

Intensive surveys are used to calibrate the densities observed during snorkel surveys. Snorkel survey data are calibrated against screw trap estimated juvenile abundance in selected drainages. Therefore, intensive panel drainages were chosen based upon the location of associated screw traps. This knowledge can be applied to the extensive surveys to better understand the production of smolts out of those drainages. For the intensive panel during 2009 and 2010, we chose Crooked Fork Creek, Fish Creek, and the Crooked River in the Clearwater River subbasin; in the Salmon River subbasin, we chose Marsh Creek and Rapid River tributary to the Little Salmon River. During 2009, the Fish Creek, Rapid River, and Marsh Creek surveys were completed by the ISMES snorkel crew and are reported by that project (Copeland and Roberts 2010). During 2010, the Big Creek, Fish Creek, and Rapid River surveys were completed by the ISMES snorkel crew and are reported by that project (Copeland et al. 2011) because those surveys were funded by that project.

We assigned effort in the target drainages in excess of minimum sample sizes computed from power analyses of 2007 data (Copeland et al. 2008) and our experiences of how many transects could be surveyed given drainage character and size. Forty transects were assigned to each large extensive drainage (Selway River, North Fork Salmon River, Potlatch River, Panther Creek, Big Creek). We realized that a survey of 40 transects in one summer season was likely an optimistic goal for surveys in the Selway River drainage. The intensive drainages and smaller extensive drainages were assigned desired sample sizes of 25 (140 total).

For the intensive and extensive panels, transect selection was based on a generalized random-tessellation stratification design (Stevens and Olsen 2004) to be a spatially-balanced probabilistic selection from all potential transects. A list of all potential transects in the Clearwater and Salmon basins was obtained from the US-EPA office in Corvallis, Oregon. These transects were plotted on a 1:100,000 stream layer and their order randomized by EPA. We used the anadromous stream data layer from StreamNet (www.streamnet.org) to determine which transects in each drainage were within the anadromous production zone. Transects that fell within a 100 m buffer of an anadromous stream were retained. An ordered list of approximately twice the desired number of transects was drawn for the study drainages. Each potential transect was assigned a unique transect identifier for data entry forms and the IDFG Standard Stream Survey database. Transect priority started with the lowest number (high priority) and proceeded to the highest number (low priority). High priority transects were included or rejected before lower priority transects could be considered in survey plans. Criteria for rejection were: 1) the transect could not be safely surveyed or transect boundaries adjusted to make it safe (see next paragraph); 2) the location was above a barrier that would block spring movement of adult steelhead; 3) there was no water in the transect at the time of survey; 4) the private property owner denied access to the transect; or 5) the transect was too wide or complex to be surveyed efficiently by the full crew (six snorkelers).

Field surveys were performed during summer base-flow conditions. Transect locations and lengths were adjusted by the crew leader based on stream conditions. The desired transect length was 100 m, but length was adjusted by the crew leader based on stream conditions. Transect bounds were adjusted to fit within hydraulic controls. A transect was relocated up to 500 m from the designated point if necessary. The percentage of each habitat type (pool, pocket water, riffle, or run) within the transect was recorded. One to five snorkelers counted fish in each transect while moving upstream. The number of snorkelers depended on the stream width and visibility. All salmonids were identified to species, counted, and size estimated to the nearest 25 mm length group. Chinook salmon parr were assigned an age based on length. Fry less than 50 mm that could not be distinguished between steelhead and cutthroat trout were counted as “trout fry.” Non-salmonids were noted if present. After the crew snorkeled each transect, they measured its final length and one to ten widths to calculate the surface area. We present summaries of salmonid densities (standardized to number per 100m^2) observed by drainage.

2009 and 2010 Core and Non-core Trend Surveys

Core trend transects were defined as locations where there had been at least one survey conducted within each 5-year period during 1984-2008 plus other transects deemed important (e.g., main stem Middle Fork Salmon River and Selway River transects). There are 218 core trend transects, and survey plans were made to do as many of these transects as logistically feasible on a 2-year rotating panel. Core trend transects are typically characterized as B-channel type (Rosgen 1985) because steelhead parr density is generally higher in this type of habitat (Petrosky and Holubetz 1988). The survey methods are consistent with the snorkel methods described above. Although these surveys are used to monitor the trend in juvenile abundance and productivity, they are not considered the best method to describe distribution or estimate absolute abundance for VSP monitoring.

2009 and 2010 Detection Probability

We evaluated the efficiency of snorkeling for juvenile steelhead at a subset of transects. A protocol modified from Thurow et al. (2006) was designed to allow us to estimate detection probability through observation of marked individuals. Briefly, juvenile steelhead were caught within the transect (by angling), measured, marked (upper caudal notch), and released as close to the location of capture as possible. The next day, snorkeling began approximately 50 m downstream of the transect and number of marked fish were recorded. Then, the main 100 m transect was snorkeled and all salmonids were counted and recorded by length group. Finally, a section approximately 50 m in length upstream of the main transect was snorkeled and number of marked fish was recorded. Boundaries of target and oversample transects were adjusted to begin and end at hydraulic controls. The habitat variables described by Thurow et al. (2006) were measured in the target transect. A target for number of resight surveys of 10% of the transects sampled was set. We present a summary of data collected at each transect. The probability of detection was computed as the number of marked fish seen in the target and oversample reaches divided by number marked. We included all marked fish observed in the oversample reaches because movement of marked fish from the target reach biased the estimate downwards. Keeping them in the calculation increases precision because each marked fish is treated as an independent trial: seen or not seen. It is assumed that fish would not move farther than 50 m between marking and the subsequent snorkel survey.

Data Management

The data resulting from the methods above are assessed for quality control, entered, and stored in two databases. The Spawning Ground Survey Database stores all of the redd survey and carcass recovery data. The Standard Stream Survey database stores all of the snorkel survey data. Both databases are publicly available via the Idaho Fish and Wildlife Information System website (https://fishandgame.idaho.gov/ifwis/portal/).

RESULTS

Wild Chinook Salmon Adult Abundance

2009 Redd Surveys

There were 2,349 Chinook salmon redds counted in Idaho trend transects during 2009 (Table 1). There are currently no redd survey trend transects identified for the following populations: Little Salmon River, Pistol Creek, Upper Middle Fork Salmon River, Lapwai/Big Canyon Creeks, Potlatch River, Lawyer Creek, and Meadow Creek.

There were a total of 2,119 redds observed in the Salmon River subbasin (Table 1). There were 989 redds in the South Fork Salmon River MPG of which most or 459 were in the South Fork Salmon River population. The Middle Fork Salmon River MPG had 575 redds of which most or 265 were in the Bear Valley Creek population. There were 555 redds in the Upper Salmon River MPG of which most or 254 were in the Upper Salmon River population above Redfish Lake Creek. Partial surveys were conducted in the East Fork South Fork Salmon River, Upper Salmon River, and the Lower Salmon River populations.

There were a total of 230 redds observed in the Clearwater River subbasin (Table 1). There were 171 redds in the Dry Clearwater MPG and 59 redds in the Wet Clearwater MPG. Most Clearwater River redds were in the South Fork Clearwater population. Partial or no surveys were conducted in Moose Creek, Lolo Creek, and Upper Selway River populations.

2010 Redd Surveys

There were 2,426 Chinook salmon redds counted in Idaho trend transects during 2010 (Table 1). There are currently no redd survey trend transects identified for the following populations: Little Salmon River, Pistol Creek, Upper Middle Fork Salmon River, Lapwai/Big Canyon Creeks, Potlatch River, Lawyer Creek, and Meadow Creek.

There were a total of 2,209 redds in the Salmon River subbasin (Table 1). There were 529 redds in the South Fork Salmon River MPG of which most or 285 were in the Secesh River population. The Middle Fork Salmon River MPG had 921 redds of which most or 418 were in the Bear Valley Creek population. There were 759 redds in the Upper Salmon River MPG of which most or 280 were in the Upper Salmon River population above Redfish Lake Creek. Partial or no surveys were conducted in the South Fork Salmon River, Secesh River, Lower Salmon River, East Fork South Fork Salmon River, Valley Creek, and Yankee Fork populations.

There were a total of 217 redds observed in the Clearwater River subbasin (Table 1). There were 144 redds in the Dry Clearwater MPG and 73 redds in the Wet Clearwater MPG. Like 2009, most Clearwater River redds were in the South Fork Clearwater population. Partial or no surveys were conducted in the Moose Creek, Lolo Creek, and the Upper Selway River populations. As of this writing, Lolo Creek population data have not been entered into the Spawning Ground Survey database.

Wild Chinook Salmon Carcass Surveys and Age Composition

2009 and 2010 Carcass Surveys

During 2009, we observed a total of 2,330 wild Chinook salmon carcasses on Idaho spawning grounds (Table 2, Figure 1). A total of 813 hatchery origin and 1,517 natural origin carcasses were recorded in the databases. During 2010, a total of 3,432 carcasses were observed (Table 3, Figure 2). A total of 713 hatchery origin and 2,719 natural origin carcasses were recorded in the databases. The total number of carcasses observed in the two years varied with survey effort and fish abundance. More carcasses were observed in 2010 than 2009 in all MPGs except the Upper Salmon River (Tables 2 and 3). The greatest between year difference occurred in the Middle Fork Salmon River MPG in the Salmon River subbasin. Carcasses in the Middle Fork Salmon River MPG increased from 197 carcasses in 2009 to 1,035 carcasses in 2010. In general, the frequency of hatchery carcasses encountered on the spawning grounds varied among MPGs, populations, and years.

2009 Carcass Age Composition

During 2009, we assigned ages to 1,010 fin rays (Table 2). Of the assigned ages, 10.7% were BY2006, 64.6% were BY2005, 24.0% were BY2004, and 0.7% were BY2003. Freshwater age was assumed to be one year for all fin rays.

For the South Fork Salmon River MPG, 13.1% of carcasses were BY2006, 63.0% were BY2005, 23.1% were BY2004, and 0.8% were BY2003 (n = 373; Table 2). For the Middle Fork Salmon River MPG, 8.9% were BY2006, 74.9% were BY2005, and 16.2% were BY2004 (n = 167). For the Upper Salmon River MPG, 9.8% were BY2006, 64.7% were BY2005, 25.0% were BY2004, and 0.5% were BY2003 (n = 419). For the Dry Clearwater MPG, 7.7% were BY2006, 38.5% were BY2005, 48.7% were BY2004, and 5.1% were BY2003 (n = 39). For the Wet Clearwater MPG 8.3% were BY2006, 50.0% were BY2005, and 41.7% were BY2004 (n = 12).

Of the 171 known ocean-age fin rays that were aged, 95.9% were aged correctly. Overall, there were 56 samples from BY2006, 98 from BY2005, and 17 from BY2004.

The length distributions of one-ocean and two-ocean groups overlapped by 9 cm (Figure 3). The overlap between two- and three-ocean length distributions was greater than 22 cm, and the length distribution for four-ocean fish was within the three-ocean length distribution.

2010 Carcass Age Composition

During 2010, we assigned ages to 1,366 fin rays (Table 3). Of the assigned ages, 2.9% were BY2007, 85.1% were BY2006, 11.6% were BY2005, and 0.4% were BY2004. Freshwater age was assumed to be one year for all fin rays.

For the South Fork Salmon River MPG, 2.8% of carcasses were BY2007, 92.3% were BY2006, 4.7% were BY2005, and 0.2% were BY2004 (n = 607; Table 3). For the Middle Fork Salmon River MPG, 2.5% were BY2007, 80.9% were BY2006, 16.0% were BY2005, and 0.6% were BY2004 (n = 356). For the Upper Salmon River MPG, 3.5% were BY2007, 76.8% were BY2006, 19.2% were BY2005, and 0.5% were BY2004 (n = 371). For the Dry Clearwater MPG, 4.0% were BY2007, 92.0% were BY2006, and 4.0% were BY2005 (n = 25). For the Wet Clearwater MPG, 100.0% were BY2006 (n = 7).

Of the 181 known ocean-age fin rays that were aged 95.2% were aged correctly. Overall, there were 37 samples from BY2007, 132 from BY2006, and 12 from BY2005.

Length distributions of one- and two-ocean groups overlapped by 22 cm (Figure 4). The overlap between two- and three-ocean groups was greater than 22 cm, and the length distribution for four-ocean fish was within the three-ocean length distribution.

Wild Chinook Salmon Smolt-To-Adult Survival Rate

Final smolt-to-adult survival rates were calculated for smolt cohorts through smolt year 2006 (Table 4). Returns for smolt years 2007-2010 are still incomplete. The SAR rate for the 2006 cohort, the last year for which all adults had returned in 2010, was 1.28% (95% CI 1.26%-1.30%). Although not yet complete, the 3.31% (95% CI 3.28%-3.35%) SAR rate for the 2008 cohort is the highest dating back to 1999.

Wild Chinook Salmon Intrinsic Population Productivity

Females Available for Natural Reproduction

The estimated number of hatchery and wild Chinook salmon crossing LGR during 2009, excluding jacks as defined by the COE, was 64,149 fish (Table 5). Overall, there were 35,758 females comprising 55.7% of the adult run. Overall estimated losses above LGR totaled 18,444 females. Hatchery take accounted for 8,576 females and angler harvest accounted for 9,868 females. Subtraction of these losses yielded a FANR estimate of 17,314 females.

The estimated number of hatchery and wild Chinook salmon crossing LGR during 2010, excluding jacks as defined by the COE, was 122,981 fish (Table 6). Overall, there were 66,399 females comprising 53.9% of the run. Overall estimated losses above LGR totaled 30,051 females. Hatchery take accounted for 9,745 females and angler harvest accounted for 20,306 females. Subtraction of these losses yielded a FANR estimate of 36,348 females.

Stock-Recruit Model

The estimated number of smolts out-migrating from the Snake River ESU past LGR during smolt year 2009 was 929,749 fish (Table 7). The estimated number of smolts in 2010 was 1,219,742 fish. These estimates cover the period March 26 to July 15 in both 2009 and 2010. They complete the data set for the 1990-2008 brood years.

The Beverton-Holt stock-recruit model fit the data very well (r^2 = 0.938, n = 19; Figure 5). For the 1990-2008 BYs, intrinsic productivity was 426 smolts per female and asymptotic production was 1.57 million smolts. There was no obvious pattern in the model residuals when compared to predicted values (data not shown). The variance might be constrained at low abundances, but there was no indication of accelerating variances with increasing abundance. We predict that smolt production for the 2009 and 2010 BYs should exceed 1.2 million smolts based on the Beverton-Holt model (Table 7).

Wild Chinook Salmon and Steelhead Juvenile Density and Spatial Structure

During 2009, 486 transects were surveyed compared to the 498 transects planned. All planned surveys were not completed during 2009 because of high and sustained snowmelt. A total of 392 transects were surveyed for the 2010 season and all planned transects were surveyed.

2009 Extensive Panel Surveys

The Potlatch River drainage, lower mainstem Clearwater steelhead population, was surveyed from June 10-17. A total of 80 transects were surveyed during 2009 (Table 8). Thirty transects were not completed, due to: 19 because of a lack of water, ten because of denied access on private property, and one because of poor visibility. Five salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr, brook trout *S. fontinalis*, and Coho salmon *Oncorhynchus kisutch*. Trout fry were the most abundant fish observed, at a mean density of 1.74 fish/100m^2, but were present in high numbers in only a few transects. Steelhead parr, with a mean density of 1.45 fish/100m^2, were more widely dispersed than trout fry with an occupancy rate, defined as the percent of transects with these species present, of 51%.

The effort to survey an extensive panel of transects in Slate Creek, Lower Salmon River tributary population, was unsuccessful due to high turbid water conditions.

The North Fork Salmon River steelhead population was sampled on July 8-August 5. The target was 40 transects, and a total of 47 transects were sampled (Table 9). Five transects were rejected, one due to lack of water present in the channel, three due to an impassible barrier, and a private landowner denied access to another transect. Seven salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr, westslope cutthroat trout *O. clarkii lewisi*, bull trout *Salvelinus confluentus*, brook trout, and mountain whitefish *Prosopium williamsoni*. At 3.84 fish/100m^2, mean density was highest for cutthroat trout. Steelhead parr were observed at a mean density of 2.15 fish/100m^2. The highest observed density of juvenile steelhead, at 13.01 fish/100m^2, was near the mouth of Hughes Creek. Occupancy rates of these combined drainages by steelhead and Chinook salmon were 60% and 15%, respectively.

The lower portion of the Selway River steelhead population was surveyed July 23-August 26. A total of 37 transects were surveyed (Table 10). Six salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr and adults, westslope cutthroat trout, bull trout, and mountain whitefish. In 2009, Chinook salmon parr were observed at the highest density at 7.48 fish/100m^2. Steelhead were observed at a mean density of 4.24 fish/100m^2 and cutthroat trout were observed at a mean density of 3.43 fish/100m^2. Steelhead were observed at an occupancy rates of 78% and Chinook salmon were observed at an occupancy rate of 57%.

2010 Extensive Panel Surveys

The Potlatch River drainage was surveyed from June 12-16 during 2010. A total of 64 transects were surveyed (Table 11). Six transects were not surveyed due to low water, and eight transects were denied access by private landowners. Three salmonid taxa were identified: trout fry, juvenile steelhead, and brook trout. At a mean density of 1.87 fish/100m^2, steelhead parr were the most common species observed with an occupancy rate of 55%.

The middle portion of the Selway River steelhead population was surveyed from July 20-27 and August 4-11. A total of 27 transects were surveyed (Table 12). Thirteen transects were not snorkeled: two were above a fish barrier, one was too dangerous to access, and 10 due to a trip cancellation because of flight restrictions. One site was found to be above a barrier after it was surveyed (Rhoda Creek 95170). Six salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr and adults, westslope cutthroat trout, bull trout, and mountain whitefish. The taxa with the highest observed mean densities were steelhead parr, at 2.30 fish/100m^2, and westslope cutthroat trout, at 4.61 fish/100m^2. Occupancy rates for steelhead were 57% and 32% for Chinook salmon. These estimates are incomplete however, because only the Moose Creek portion of the middle Selway drainage was surveyed.

The Panther Creek steelhead population was sampled on July 7 and August 6. The target was 20 transects and a total of 21 transects were sampled (Table 13). Five transects were rejected due to an impassible barrier to spring movement of adult steelhead, and another two were not completed because of their proximity downstream from the confluence of Blackbird Creek, a known highly toxic stream. Seven salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr, cutthroat trout, bull trout, brook trout, and mountain whitefish. Mean density was greatest for juvenile steelhead, at 3.83 fish/100m^2. The highest observed mean density of juvenile steelhead was near the mouth of Clear Creek, at 13.49 fish/100m^2. Occupancy rates of the drainage were 75% for steelhead and 24% for Chinook salmon. These estimates are for the southern portion of the drainage only.

2009 Intensive Panel Surveys

During 2009, the Crooked River drainage in the South Fork Clearwater steelhead population was surveyed June 24-July 1. A total of 26 transects were surveyed (Table 14). All transects that were visited were surveyed, except one transect did not have enough water to snorkel. Six salmonid taxa were identified: steelhead juveniles and adults, Chinook salmon parr and adults, westslope cutthroat trout, bull trout, brook trout, and mountain whitefish. Cutthroat trout were the most abundant species present, with a mean density of 1.77 fish/100m^2. Steelhead were also common throughout the drainage with a mean density at 0.72 fish/100m^2. Bull trout and brook trout were found in the upper part of the drainage and whitefish were present in the lower main stem. Occupancy rates of the drainage were 62% for steelhead and 15% for Chinook salmon.

The Crooked Fork drainage in the Lochsa River steelhead population was surveyed July 8-15. A total of 22 transects were surveyed (Table 15). Three transects were not surveyed due to the lack of a trail which would have resulted in too much time being used to complete these transects (only one of these transects had been previously surveyed). Six salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr and adults, westslope cutthroat trout, bull trout, and mountain whitefish. Chinook salmon were the most commonly encountered species and were observed at almost every transect and had a mean density of 2.13 fish/100m^2. Cutthroat trout were also observed at almost every transect and had a mean density of 1.75 fish/100m^2. Steelhead were observed in most transects and had a mean density at 1.07 fish/100m^2. Occupancy rates of the drainage were 86% for steelhead and 64% for Chinook salmon.

The Marsh Creek drainage in the upper main-stem Middle Fork Salmon River steelhead population was surveyed July 22-26 by the ISMES crew (results in Copeland and Roberts 2010). The goal was to snorkel at least 25 transects and a total of 26 transects were sampled (Table 16). Seven salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr, cutthroat trout, bull trout, brook trout, and mountain whitefish. Mean density was highest for Chinook salmon (1.04 fish/100m^2) with the highest observed mean density in Beaver Creek (5.80 fish/100m^2). Occupancy rates of the drainage were 65% for steelhead and 42% for Chinook salmon.

2010 Intensive Panel Surveys

During 2010, the Crooked River drainage in the South Fork Clearwater steelhead population was surveyed June 23-30 and July 11-15. A total of 26 transects were surveyed (Table 17). All transects that were visited were surveyed. Six salmonid taxa were identified: steelhead juveniles and adults, Chinook salmon parr and adults, westslope cutthroat trout, bull trout, brook trout, and mountain whitefish. Cutthroat trout were observed at the highest mean density at 1.73 fish/100m^2. Steelhead were also common throughout the drainage and were observed at a mean density of 0.53 fish/100m^2 respectively. Bull trout and brook trout were found in the upper part of the drainage and whitefish were present in the lower main stem. Occupancy rates of the drainage were 77% for steelhead and 4% for Chinook salmon.

The Crooked Fork drainage in the Lochsa River steelhead population was surveyed July 21-28. A total of 26 transects were surveyed (Table 18). Six salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr and adults, westslope cutthroat trout, bull trout, and mountain whitefish. Westslope cutthroat trout and steelhead were the most commonly encountered species; both were observed at almost every transect and had similar mean densities, at 1.33 fish/100m^2 and 1.53 fish/100m^2, respectively. Mountain whitefish were observed throughout the drainage and had a mean density of 0.10 fish/100m^2. Occupancy rates for the drainage were 85% for steelhead and 46% for Chinook salmon.

2009 Core and Non-Core Trend Surveys

During 2009, a total of 139 core and non-core trend transects were surveyed in the Salmon River MPG (Table 19). Six salmonid species were identified. Steelhead were the most commonly observed species and were identified in 107 transects, followed by mountain whitefish at 96 transects, and Chinook salmon at 81 transects. Chinook salmon densities observed in a side channel of the Salmon River, Hannah Slough, were the highest mean densities observed for this species or any other salmonid taxa at 298.69 fish/100m^2.

In the Middle Fork Salmon River drainage we observed two additional hybrid taxa at low densities: brook/bull trout and cutthroat/steelhead hybrids. Chinook salmon parr and juvenile steelhead were present at many transects in the South Fork Salmon River drainage with mean densities of 4.95 fish/100m^2 and 1.72 fish/100m^2, respectively. In the main stem of the Middle Fork Salmon River, 29 trend transects were surveyed. In the main stem transects, seven salmonid taxa were identified: trout fry, juvenile steelhead, Chinook salmon parr, cutthroat trout, bull trout, brook trout, and mountain whitefish. Mean density was highest for cutthroat trout, at 2.12 fish/100m^2, with the highest observed for this species, at 14.01 fish/100m^2, in the Velvet transect. No trout fry were observed in the main stem Middle Fork Salmon River and bull and brook trout were only observed at the most upstream transect. The observed mean densities in the Salmon River drainage increased from 2008 to 2009 for steelhead (2.69 fish/100m^2 vs. 1.44 fish/100m^2) and Chinook salmon (9.03 fish/100m^2 vs. 2.59 fish/100m^2; Copeland et al. 2009).

A total of 73 core and non-core trend transects were surveyed in the Clearwater River MPG (Table 20). Steelhead were observed at 57 transects, cutthroat trout were identified in 53 transects, and Chinook salmon in 46 transects, excluding the Potlatch River drainage. Brook trout were observed in 16 transects in the Potlatch and South Fork Clearwater drainages and bull trout were observed in 12 transects in the Lochsa and South Fork Clearwater drainages. Hatchery steelhead and Chinook salmon were observed in American and East Fork Potlatch rivers. We also observed an occurrence of a cutthroat/steelhead hybrid in the Crooked River. Steelhead densities were lower (1.97 fish/100m^2 vs. 4.77 fish/100m^2) and Chinook salmon were higher (9.93 fish/100m^2 vs. 1.80 fish/100m^2) when compared to the 2008 general parr monitoring (GPM) trend transect surveys (Copeland et al. 2009).

2010 Core and Non-Core Trend Surveys

During 2010, a total of 113 core and non-core trend transects were surveyed in the Salmon River MPG (Table 21). Eight salmonid taxa were identified. Steelhead were the most commonly observed species and were identified in 77 transects, followed by mountain whitefish at 74 transects, and Chinook salmon at 55 transects. Chinook salmon densities observed in a side channel of the Salmon River, Hannah Slough, were the highest densities observed for this species or any other salmonid taxa in this year at 76.98 fish/100m^2. We observed brook/bull trout hybrids at low densities at three transects. Compared to the 2009 GPM trend transect surveys in the Salmon River drainage above, the steelhead densities were similar (2.69 fish/100m^2 vs. 2.32 fish/100m^2) and Chinook salmon densities lower (9.03 fish/100m^2 vs. 4.44 fish/100m^2).

A total of 88 core and non-core trend transects were surveyed in the Clearwater River MPG (Table 22). Steelhead were identified at 75 transects, cutthroat trout at 68 transects, and Chinook salmon at 48 transects excluding the Potlatch River drainage. Brook trout were observed in 28 transects, mostly in the Potlatch and South Fork Clearwater drainages but also at one transect in the lower Lochsa River drainage (Old Man Creek). Bull trout were observed at 10 transects in the Lochsa, Selway, and South Fork Clearwater River drainages. Hatchery Chinook salmon were observed in American River. Densities in 2010 were similar to 2009 for steelhead (1.97 fish/100m^2 vs. 2.07 fish/100m^2) and Chinook salmon parr (9.93 fish/100m^2 vs. 7.98 fish/100m^2.

2009 Detection Probability

We conducted mark-resight studies at 21 locations to assess detection probability for steelhead parr during 2009 (Table 23). Detection probability of steelhead parr was highly variable, ranging from 6% to 86%. Crews marked 400 fish and detected 160, or 40% of them. Twenty were observed outside of the main survey unit, seven of which were downstream. At some transects, cutthroat trout were also marked.

2010 Detection Probability

During 2010, we assessed detection probability at 22 locations for steelhead parr following the same methods used during 2009 (Table 24). Detection probability ranged from 7% to 83%. Crews marked 516 fish and detected 247, or 48% of them. Seventeen were observed outside of the target survey unit in the oversample reaches, nine of which were downstream. At three transects, cutthroat trout were marked and included in detection calculations (n = 9).

DISCUSSION

The majority of the data presented in this report is acquired during Chinook salmon spawning ground surveys, which typically includes both redd and carcass surveys. For monitoring wild Chinook salmon abundance, redd surveys account for a large proportion of the available spawning habitat in Idaho. In contrast to the redd surveys, the spatial and temporal distribution of carcass surveys could be improved (Figures 1 and 2). To better monitor all wild populations during spawning ground surveys, increased effort or spatially balanced sampling would benefit the analysis and interpretation of the data used to monitor these wild populations.

Currently, population-specific adult Chinook salmon abundances are indexed using redd surveys in most populations. Because redd surveys are conducted to preserve historical trend data the methods, techniques, and survey areas are not consistent among populations but are consistent for each population among years (Hassemer 1993a). The IDFG redd survey dataset is extensive and has experienced some major improvements. Data management has changed from Microsoft Access™ databases and Excel™ spreadsheets to a more secure SQL Server database that can be shared with cooperators and will safely store the entire trend dataset including carcass data (https://fishandgame.idaho.gov/ifwis/portal/page/spawning-ground-survey). Furthermore, additional quality control measures have been incorporated into the data management process to ensure high quality data are available in the future. These improvements in data management have allowed us to identify data needs to help guide project planning in the future. It should be noted that not all redd surveys conducted in Idaho are presented here. Only trend monitoring surveys are presented to ensure continuity among methods in the future. For this report, we have not generated population-specific abundance estimates because we are in the process of evaluating the methods and assumptions involved.

Biological data from carcass surveys provide estimates of length-at-age, age composition, sex composition, and hatchery fraction at the independent population scale with a resolution not currently available using data collected at LGR. Most of these metrics will be used to estimate the productivity of each population in the future. Tissue samples obtained from carcasses also contribute to the GSI baseline used to estimate the proportions of returning adults by population for harvest management and abundance monitoring (Ackerman and Campbell 2011). Because these metrics can vary widely among populations, we have a goal of 100 carcass samples from each population. We consider the minimum of 100 to be conservatively high to adequately describe demographic parameters for an unknown population size. In Idaho, wild Chinook population-specific escapement estimates are difficult to make before fish reach the spawning grounds.

Population-specific age composition is reported as frequencies or percentages of fish sampled from the spawning grounds (Tables 2 and 3). Where sample sizes are approximately equal to 100, we consider the frequencies to be representative of the population's age composition. The frequencies of hatchery and natural origin carcasses are preliminary until all carcass survey data have been entered into the Spawning Ground Survey database, and any inconsistencies between databases are rectified. For the South Fork Salmon and Clearwater MPGs, carcass data obtained by the Nez Perce Tribe have not been entered into the Spawning Ground Survey database; therefore, the frequencies of hatchery and natural origin carcasses are incomplete for those populations.

The Chinook salmon 0.38% SAR for smolt year 2005 was the second lowest on record but has been gradually increasing since then (Table 4). This increasing survival trend appears to be continuing through smolt years 2007 and 2008, although neither cohort returns are complete.

The stock-recruit curve is now describing productivity for a substantial time series (Figure 5; $r^2 = 0.938$, $n = 19$). Copeland et al. (2009) predicted wild Chinook salmon smolt production for BY2007 (smolt year 2009) and BY2008 (smolt year 2010) using the stock-recruit curve. The observed number of smolts in 2009 was within 17% of the prediction and was within 10% of the prediction in 2010. This reinforces our confidence with this model's performance. Given the escapements observed, we predict approximately 1.3 million smolts in 2011 and 1.4 million smolts in 2012. Asymptotic production appears to be near 1.5 million wild Chinook salmon smolts.

There are various candidate hypotheses for this observed asymptote in Snake River wild Chinook salmon productivity (Table 25). We also recognize that over the course of the time series several of the assumptions or methods may have changed or could be improved (e.g., 20% mortality between LGR and the spawning grounds). Of particular note, Schrader et al. (2011) estimated 6,169 (95% CI 5,412-6,981) female wild Chinook salmon at LGR in spawn year 2009, whereas the FANR estimate is 17,314 females on the spawning grounds (Table 5). This suggests that at least 11,145 females on the spawning grounds were of hatchery origin. This high proportion of hatchery origin carcasses was not observed in 2009 or 2010, which suggests the FANR might overestimate hatchery origin spawners (Table 2 and 3). We continued using previous methods for this analysis to maintain continuity for the time series. In the future, the variables, constants, and assumptions involved in this stock-recruit analysis will be reviewed. Although some of the assumptions used in the past might change, we do not anticipate this will significantly change the shape of the curve.

Steelhead adult abundance and productivity in Idaho are monitored by the ISMES project; however, INPMEP continues to monitor the spatial structure and density of juvenile steelhead and Chinook salmon during snorkel surveys. The GPM program has monitored the abundance and distribution of anadromous and resident salmonids since 1985. A large proportion of Idaho's steelhead and Chinook salmon habitat is located within congressionally designated wilderness areas, and the GPM dataset is the best description of juvenile salmonid spatial structure and density in Idaho (Copeland and Meyer 2011). Spring snowmelt runoff in Idaho precludes the use of redd surveys for steelhead in Idaho. As a result, GPM data are particularly important for monitoring the spatial structure and juvenile-to-juvenile productivity of these ESA listed steelhead populations.

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Table 1. Wild Chinook salmon redds counted in Idaho trend transects in the Salmon River and Clearwater River subbasins during 2009 and 2010 by major population group and independent population.

Major and Independent Population			2009	2010
South Fork Salmon River				
	Little Salmon River		n/t[a]	n/t
	South Fork Salmon River		459	244[b]
	Secesh River		370	285[b]
	East Fork South Fork Salmon River		160[b]	n/c[c]
		Total	989	529
Middle Fork Salmon River				
	Chamberlain Creek		58	78
	Big Creek		124	92
	Lower Middle Fork Salmon		1	1
	Camas Creek		12	17
	Loon Creek		28	20
	Pistol Creek		n/t	n/t
	Sulphur Creek		23	52
	Bear Valley Creek		265	418
	Marsh Creek		64	243
	Upper Middle Fork Salmon		n/t	n/t
		Total	575	921
Upper Salmon River				
	North Fork Salmon River		28	39
	Lemhi River		61	79
	Pahsimeroi River		42	47
	Lower Salmon River		48[b]	63[b]
	East Fork Salmon River		59	209
	Yankee Fork River		6	3[b]
	Valley Creek		43	38[b]
	Upper Salmon River		254	280
	Panther Creek		14	1
		Total	555	759
Dry Clearwater				
	Lapwai/Big Canyon Creeks		n/t	n/t
	Potlatch River		n/t	n/t
	Lawyer Creek		n/t	n/t
	South Fork Clearwater		171	144
		Total	171	144
Wet Clearwater				
	Lolo Creek		n/c[c]	n/c
	Lochsa River		51	50
	Meadow Creek		n/t	n/t
	Moose Creek		n/c	n/c
	Upper Selway River		8[b]	23[b]
		Total	59	73
		Grand total	2,349	2,426

[a] n/t = No trend monitoring sites have been identified.
[b] Indicates partial survey. Some areas were not surveyed during 2010 due to a helicopter accident.
[c] n/c = No survey conducted.

Table 2. Brood year and age class frequencies of wild Chinook salmon carcasses recovered on Idaho spawning grounds during 2009. Freshwater age was assumed to be one year. Frequencies of hatchery origin (HOR) and natural origin (NOR) carcasses are summed between the BioSamples database and the Spawning Ground Survey database.

	Brood year and age class					All Carcasses	
	2006	2005	2004	2003	Total		
Major and Independent Population	1.1	1.2	1.3	1.4	Aged	HOR	NOR
South Fork Salmon River							
Little Salmon River	-	-	-	-	0	0	0
South Fork Salmon River	4	56	35		95	1	272
Secesh River	8	56	15	1	80	0	0
East Fork South Fork Salmon River	37	123	36	2	198	0	0
Total	49	235	86	3	373	1	272
Middle Fork Salmon River							
Chamberlain Creek	-	-	-	-	0	-	-
Big Creek	-	-	-	-	0	-	-
Lower Middle Fork Salmon	-	-	-	-	0	-	-
Camas Creek	-	-	-	-	0	-	-
Loon Creek	-	-	-	-	0	-	-
Sulphur Creek	-	-	-	-	0	-	-
Bear Valley Creek	8	74	23	-	105	0	197
Marsh Creek	7	51	4	-	62	-	63
Upper Middle Fork Salmon	-	-	-	-	0	-	-
Total	15	125	27	0	167	0	260
Upper Salmon River							
North Fork Salmon River	2	2	-	-	4	1	4
Lemhi River	-	10	3	-	13	1	22
Pahsimeroi River	-	16	5	-	21	2	33
Lower Salmon River	10	63	16	1	88	46	100
East Fork Salmon River	2	14	8	-	24	0	7
Yankee Fork	-	2	3	-	5	507	16
Valley Creek	1	29	13	-	43	13	47
Upper Salmon River	26	135	57	1	221	188	255
Panther Creek	-	-	-	-	0	-	-
Total	41	271	105	2	419	758	484
Dry Clearwater							
Lapwai/Big Canyon Creeks	-	-	-	-	0	-	-
Potlatch River	-	-	-	-	0	-	-
Lawyer Creek	-	-	-	-	0	-	-
South Fork Clearwater	3	15	19	2	39	24	494
Total	3	15	19	2	39	24	494
Wet Clearwater							
Lolo Creek	-	-	-	-	0	-	-
Lochsa River	1	6	5	-	12	32	5
Meadow Creek	-	-	-	-	0	-	-
Moose Creek	-	-	-	-	0	-	-
Upper Selway River	-	-	-	-	0	0	2
Total	1	6	5	0	12	32	7
Grand total	109	652	242	7	1,010	813	1,517

Table 3. Brood year and age class frequencies of wild Chinook salmon carcasses recovered on Idaho spawning grounds during 2010. Freshwater age was assumed to be one year. Frequencies of hatchery origin (HOR) and natural origin (NOR) carcasses summed between the BioSamples database and the Spawning Ground Survey database.

	Brood year and age class					**All Carcasses**	
	2007	**2006**	**2005**	**2004**	**Total**		
Major and Independent Population	**1.1**	**1.2**	**1.3**	**1.4**	**Aged**	**HOR**	**NOR**
South Fork Salmon River							
Little Salmon River	-	-	-	-	0	-	-
South Fork Salmon River	1	87	12	-	100	4	671
Secesh River	5	112	9	-	126	-	-
East Fork South Fork Salmon River	11	361	8	1	381	7	0
Total	17	560	29	1	607	11	671
Middle Fork Salmon River							
Chamberlain Creek	-	18	1	-	19	0	51
Big Creek	2	31	5	1	39	2	27
Lower Middle Fork Salmon	-	-	-	-	0	-	-
Camas Creek	-	5	-	-	5	0	5
Loon Creek	-	3	-	-	3	0	5
Sulphur Creek	-	46	4	-	50	0	80
Bear Valley Creek	7	89	34	-	130	0	545
Marsh Creek	-	96	13	1	110	5	315
Upper Middle Fork Salmon	-	-	-	-	0	-	-
Total	9	288	57	2	356	7	1,028
Upper Salmon River							
North Fork Salmon River	1	26	-	-	27	0	32
Lemhi River	-	31	-	-	31	0	35
Pahsimeroi River	-	12	3	-	15	0	18
Lower Salmon River	1	35	8	-	44	3	45
East Fork Salmon River	1	23	11	-	35	27	52
Yankee Fork	-	-	-	-	0	0	30
Valley Creek	1	37	4	-	42	0	81
Upper Salmon River	9	121	45	2	177	69	502
Panther Creek	-	-	-	-	0	-	-
Total	13	285	71	2	371	99	830
Dry Clearwater							
Lapwai/Big Canyon Creeks	-	-	-	-	0	-	-
Potlatch River	-	-	-	-	0	-	-
Lawyer Creek	-	-	-	-	0	-	-
South Fork Clearwater	1	23	1	-	25	602	163
Total	1	23	1	0	25	602	163
Wet Clearwater							
Lolo Creek	-	-	-	-	0	-	-
Lochsa River	-	6	-	-	6	17	24
Meadow Creek	-	-	-	-	0	-	-
Moose Creek	-	-	-	-	0	-	-
Upper Selway River	-	1	-	-	1	0	3
Total	0	7	0	0	7	17	27
Grand total	40	1,163	158	5	1,366	713	2,719

Table 4. Estimated number of wild Chinook salmon smolts at Lower Granite Dam, number of adults at Lower Granite Dam by ocean-age, and percent smolt-to-adult survival rate (% SAR). Confidence intervals are at 95% and are given in parentheses.

Smolt Year	Smolts	Ocean-Age 1	2	3	4	%SAR (95% CI)
1996	419,826	[a]	845	467	0	0.31 (0.30-0.33)
1997	161,157	161	2,206	423	33	1.75 (1.69-1.82)
1998	599,159	241	7,177	1,242	306	1.50 (1.47-1.53)
1999	1,560,298	1,550	41,999	13,532	639	3.70 (3.67-3.73)
2000	1,344,382	1,829	15,882	23,234	50	3.05 (3.02-3.08)
2001	490,534	364	6,518	2,115	94	1.85 (1.82-1.89)
2002	1,128,582	2,309	18,364	2,350	14	2.04 (2.02-2.07)
2003	1,455,786	1,276	6,056	1,519	154	0.62 (0.61-0.63)
2004	1,517,951	635	7,173	3,415	74	0.74 (0.73-0.76)
2005	1,734,464	312	4,007	2,188	20[b]	0.38 (0.37-0.39)
2006	1,227,474	1,246	11,483	2,957[b]	0[c]	1.28 (1.26-1.30)
2007	787,150	2,551	10,014[b]	1,370[c]	[d]	1.77 (1.74-1.80)
2008	856,556	3,488[b]	24,900[c]	[d]		3.31 (3.28-3.35)
2009	929,749	1,370[c]	[d]			0.15 (0.14-0.16)
2010	1,219,742	[d]				

[a] One-ocean samples were not collected.
[b] From spawn year 2009 Lower Granite Dam report (Schrader et al. 2011).
[c] Preliminary until the spawn year 2010 Lower Granite Dam report is complete (Schrader et al., in preparation).
[d] Adult return of cohort is incomplete.

Table 5. Estimated adult Chinook salmon returns to Lower Granite Dam, percentage of females based on hatchery sex ratios, loss accounting for harvest and hatcheries, and females available for natural reproduction (FANR) for 2009. Harvest was increased by 10% to account for hooking mortality.

	Run Type		
Estimate	**Spring**	**Summer**	**Total**
Dam count	49,667	14,482	64,149
Percent females	55.9	55.2	55.7
Total females	27,764	7,994	35,758
Hatchery	3,934	4,642	8,576
Harvest	7,531	2,337	9,868
FANR	16,299	1,015	17,314

Table 6. Estimated adult Chinook salmon returns to Lower Granite Dam, percentage of females based on hatchery sex ratios, loss accounting for harvest and hatcheries, and females available for natural reproduction (FANR) for 2010. Harvest was increased by 10% to account for hooking mortality.

	Run Type		
Estimate	**Spring**	**Summer**	**Total**
Dam count	94,203	28,778	122,981
Percent females	52.4	59.2	53.9
Total females	49,362	17,037	66,399
Hatchery	4,775	4,970	9,745
Harvest	15,118	5,188	20,306
FANR	29,469	6,879	36,348

Table 7. Abundance of females available for natural reproduction (FANR) and the number of wild smolts by brood year.

Brood Year	Smolt Year	FANR	Smolts
1990	1992	4,976	527,000
1991	1993	2,916	627,037
1992	1994	6,826	627,942
1993	1995	8,514	1,558,786
1994	1996	1,043	419,826
1995	1997	497	161,157
1996	1998	1,556	599,159
1997	1999	11,885	1,560,298
1998	2000	3,726	1,344,382
1999	2001	1,630	490,534
2000	2002	8,733	1,128,582
2001	2003	51,902	1,455,786
2002	2004	31,415	1,517,951
2003	2005	26,126	1,734,464
2004	2006	28,374	1,227,474
2005	2007	10,899	787,150
2006	2008	9,253	856,556
2007	2009	8,562	929,749
2008	2010	19,823	1,219,742
2009	2011	17,314	1,297,474[a]
2010	2012	36,348	1,429,280[a]

[a] Predicted values based on the Beverton-Holt model.

Table 8. Densities (fish/100m^2) of salmonids observed at extensive panel transects snorkeled in the Potlatch River drainage in the lower mainstem Clearwater steelhead population, June 10-17, 2009. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species, but do not include dry transects.

		Density						
Stream	Transect	Trout Fry	Steelhead	Chinook Salmon	Coho Salmon	Brook Trout	Visibility (m)	Temp (C)
Big Bear Creek	30690	0.00	0.00	0.00	0.00	0.00	0.5	23.0
Big Bear Creek	79842	0.00	0.00	0.00	0.00	0.00	1.3	18.0
Big Bear Creek	91154	2.64	1.71	0.00	0.00	0.00	1.4	22.5
Big Bear Creek	106514	0.00	4.49	0.00	0.00	0.00	1.2	16.5
Big Bear Creek	107538	5.86	5.39	0.00	0.00	0.00	1.0	19.5
Big Bear Creek	119826	0.00	0.15	0.00	0.00	0.00	1.2	24.0
Big Bear Creek	122898	0.00	0.00	0.00	0.00	0.00	0.5	13.0
Big Bear Creek	169954	0.00	0.00	0.00	0.00	0.00	0.8	17.5
Bob's Creek	35697	0.17	0.00	0.00	0.00	3.66	-	11.5
Bob's Creek	37745	0.00	0.00	0.00	0.00	4.90	2.2	14.0
Bob's Creek	54129	0.00	0.00	0.00	0.00	19.12	-	12.0
Bob's Creek	86897	0.28	0.00	0.00	0.00	16.02	2.6	12.0
Bob's Creek	103281	0.00	0.75	0.00	0.00	9.78	3.7	14.0
Brush Creek	137186	0.00	0.00	0.00	0.00	0.00	0.5	-
Brush Creek	211938	0.00	0.00	0.00	0.00	0.00	0.5	-
Cedar Creek	16866	27.34	4.14	0.00	0.00	0.00	0.6	20.0
Cedar Creek	26338	0.00	0.00	0.00	0.00	0.00	0.5	14.0
Cedar Creek	59106	0.00	0.00	0.00	0.00	0.00	0.7	13.0
Corral Creek	15330	0.57	0.00	0.00	0.00	0.00	0.3	20.0
Corral Creek	48098	0.33	0.00	0.00	0.00	0.00	0.1	18.0
Corral Creek	60386	0.00	0.00	0.00	0.00	0.00	0.6	21.0
Corral Creek	105442	0.00	2.21	0.00	0.00	0.00	0.7	20.0
Cougar Creek	18	0.00	0.00	0.00	0.00	0.00	0.2	12.0
Dry Creek	152594	0.00	0.00	0.00	0.00	0.00	0.6	19.5
EF Big Bear Creek	36882	0.47	3.27	0.00	0.00	0.00	0.6	12.0
EF Big Bear Creek	126946	0.00	3.39	0.00	0.00	0.00	1.5	11.0
EF Potlatch River	2929	0.00	2.48	0.00	0.00	1.35	1.9	12.0
EF Potlatch River	13169	0.00	4.72	0.00	0.00	0.52	1.4	11.0
EF Potlatch River	34786	0.00	0.00	0.00	0.00	0.00	1.3	15.5
EF Potlatch River	45937	0.00	0.41	0.00	0.00	4.65	1.2	15.0
EF Potlatch River	95089	3.46	0.49	0.00	0.00	16.30	2.0	13.5
EF Potlatch River	130018	0.00	0.75	0.00	0.00	0.11	1.0	12.5
EF Potlatch River	134001	0.00	2.77	0.00	0.00	5.55	1.4	13.0
EF Potlatch River	136049	0.00	3.07	0.00	0.00	3.23	1.7	15.0
EF Potlatch River	144241	0.00	2.86	0.00	0.00	2.25	1.7	11.5
EF Potlatch River	168817	0.00	0.28	0.00	0.00	0.00	1.2	13.0
Feather Creek	122850	0.00	0.00	0.00	0.00	3.65	1.2	12.0
Jackson Creek	26954	0.00	1.04	0.00	0.00	0.00	2.3	11.5
Laguna Creek	106466	0.00	1.78	0.00	0.00	0.00	0.7	13.0
Leopold Creek	38626	0.00	0.00	0.00	0.00	0.00	0.4	12.0
Leopold Creek	3810	0.00	1.73	0.00	0.00	0.00	0.8	11.0
Little Bear Creek	13330	3.17	12.68	0.00	0.00	0.00	0.8	11.5
Little Bear Creek	144402	0.19	4.81	0.00	0.00	0.00	0.8	17.0
Little Bear Creek	158226	3.06	0.31	0.00	0.00	0.00	1.0	17.0
Little Bear Creek	173074	0.00	9.73	0.00	0.00	1.82		7.0
Little Bear Creek	177170	0.00	1.61	0.00	13.07	0.00	-	16.0
MF Big Bear Creek	40978	0.00	0.00	0.00	0.00	0.00	0.7	23.0
MF Big Bear Creek	172050	0.00	0.00	0.00	0.00	0.00	0.6	18.0
Middle Potlatch Creek	14354	8.75	0.00	0.00	0.00	0.00	-	22.0
Middle Potlatch Creek	47122	0.00	0.27	0.00	0.00	0.00	-	20.0
Middle Potlatch Creek	55314	81.05	0.00	0.00	0.00	0.00	-	16.0
Middle Potlatch Creek	76818	0.00	0.00	0.00	0.00	0.00	-	-

Table 8. Continued.

Stream	Transect	Density: Trout Fry	Steelhead	Chinook Salmon	Coho Salmon	Brook Trout	Visibility (m)	Temp (C)
Porcupine Creek	66181	0.00	0.00	0.00	0.00	0.00	-	10.0
Potlatch River	8210	0.00	0.00	0.00	0.00	0.00	1.6	18.0
Potlatch River	18402	0.15	0.59	0.00	0.00	0.00	1.3	19.5
Potlatch River	49170	0.00	0.07	0.00	0.00	0.00	1.3	19.0
Potlatch River	75746	0.30	1.19	0.00	0.00	0.00	1.5	20.0
Potlatch River	81890	0.00	0.00	0.00	0.00	0.09	2.0	12.0
Potlatch River	83938	0.00	0.74	0.00	0.00	0.00	1.3	20.0
Potlatch River	114706	0.00	0.16	0.00	0.00	0.00	1.4	19.0
Potlatch River	116706	0.13	0.77	0.26	0.00	0.00	0.9	23.0
Potlatch River	149474	0.00	0.45	0.00	0.00	0.00	1.0	23.0
Purdue Creek	139234	0.00	0.00	0.00	0.00	0.00	1.1	12.0
Randal Flats Creek	119314	0.00	0.00	0.00	0.00	0.00	0.7	16.5
Ruby Creek	2018	0.00	0.00	0.00	0.00	0.00	1.2	13.0
Ruby Creek	31714	0.00	0.00	0.00	0.00	12.42	1.1	13.0
Ruby Creek	67554	0.00	0.00	0.00	0.00	0.00	1.0	13.0
Ruby Creek	113634	0.00	0.00	0.00	0.00	2.76	3.1	14.0
Schwartz Creek	24594	0.48	5.72	0.00	0.00	0.00	1.2	12.0
Schwartz Creek	28642	0.00	0.00	0.00	0.00	0.00	0.8	9.0
Schwartz Creek	36882	0.00	0.00	0.00	0.00	0.00	0.8	9.0
Talapus Creek	56453	0.00	0.00	0.00	0.00	0.00	0.8	9.0
Talapus Creek	65554	0.00	0.00	0.00	0.00	0.00	0.8	9.0
WF Little Bear Creek	60434	0.00	0.51	0.00	0.00	0.00	0.5	20.0
WF Little Bear Creek	78354	0.00	1.58	0.00	0.00	0.00	1.4	14.5
WF Little Bear Creek	100882	0.00	9.02	0.00	0.00	0.00	1.3	17.0
WF Little Bear Creek	136210	2.69	13.45	0.00	0.22	0.00	0.8	18.0
WF Little Bear Creek	150034	0.00	2.22	0.00	0.00	0.00	1.7	17.0
WF Potlatch River	16354	0.00	2.11	0.00	0.00	0.19	1.0	15.0
WF Potlatch River	121989	0.00	0.00	0.00	0.00	0.00	0.9	10.0
Mean		1.74	1.43	0.00	0.16	1.34		
SD		9.51	2.70	0.03	1.45	3.75		

Table 9. Densities (fish/100m^2) of salmonids observed at extensive panel transects snorkeled in the North Fork Salmon River steelhead population, July 8-August 5, 2009. Area includes tributaries to the Salmon River between the North Fork and Panther Creek. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density								
Stream	Transect	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (C)
Dahlonega Creek	3039	0.00	0.00	0.00	10.86	0.00	1.81	0.00	1.8	12.0
Dahlonega Creek	29663	0.00	0.00	0.00	16.38	0.00	0.91	0.00	2.2	14.0
Dahlonega Creek	68575	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	12.0
Dahlonega Creek	111583	3.44	9.74	0.00	1.72	0.29	0.00	0.00	1.5	12.0
Hughes Creek	28383	8.41	13.01	0.20	0.40	0.00	0.00	0.00	3.7	13.0
Hughes Creek	60895	0.00	0.42	0.00	1.27	0.00	0.00	0.00	3.1	7.0
Hughes Creek	77631	0.23	0.23	0.00	3.63	0.00	0.00	0.00	2.7	10.0
Hughes Creek	98015	0.88	1.17	0.00	4.40	0.00	0.00	0.00	1.6	11.0
Hughes Creek	130783	1.21	2.01	0.00	1.01	0.00	0.00	0.00	2.7	10.0
Hull Creek	48863	0.00	0.00	0.00	1.25	0.00	21.88	0.00	1.7	13.0
Indian Creek	191	0.51	6.16	0.00	1.54	0.00	0.00	1.03	1.8	8.0
Indian Creek	40767	0.00	0.91	0.00	0.45	0.00	0.00	0.00	2.7	10.0
Indian Creek	65727	0.00	3.40	0.00	1.32	0.00	0.00	0.00	3.1	9.0
Indian Creek	73535	0.00	1.45	0.00	8.71	0.73	2.18	0.00	2.9	9.0
Indian Creek	94015	0.00	1.22	0.00	2.04	0.00	0.00	0.00	2.0	9.0
Indian Creek	98111	0.26	4.87	0.00	0.77	0.00	0.00	0.00	2.0	9.0
Indian Creek	126783	0.34	0.68	0.00	3.76	0.68	0.00	0.00	2.2	9.0
Moose Creek	11743	0.00	0.00	0.00	4.50	0.00	0.00	0.00	2.1	11.0
NF Salmon River	19935	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	9.0
NF Salmon River	20959	0.96	3.19	0.82	0.15	0.00	0.00	9.72	1.6	12.0
NF Salmon River	21471	1.61	2.42	0.46	2.65	0.00	0.00	0.12	2.4	9.0
NF Salmon River	24287	0.87	8.29	12.21	3.78	0.15	0.15	1.89	3.1	16.0
NF Salmon River	61151	6.81	1.04	10.96	5.25	0.29	0.12	2.31	2.4	14.0
NF Salmon River	93919	10.74	4.03	3.07	0.74	0.28	0.00	2.44	4.0	12.0
NF Salmon River	106207	2.22	8.31	1.94	4.71	0.00	0.00	0.55	3.2	15.0
NF Salmon River	118239	0.33	0.00	0.00	2.96	0.00	0.00	0.00	2.5	10.5
NF Sheep Creek	44767	0.00	0.00	0.00	0.00	1.47	0.00	0.00	6	7.0
Pierce Creek	44511	0.00	0.00	0.00	13.89	0.00	0.00	0.00	2.0	11.0
Pierce Creek	110047	3.69	2.87	0.00	10.25	0.00	0.00	0.00	1.8	12.0
Pine Creek	15071	0.00	0.72	0.00	0.72	0.00	0.00	0.00	1.7	9.0
Pine Creek	17119	0.00	10.31	0.00	3.44	0.49	0.00	0.00	1.5	12.0
Pine Creek	82655	0.00	0.00	0.00	21.55	0.55	0.00	0.00	2.7	13.0
Pine Creek	129759	2.50	6.51	0.00	6.01	2.50	0.00	0.00	1.3	11.0
Pruvan Creek	134879	0.00	0.00	0.00	0.00	2.47	0.00	0.00	2.5	5.0
Sheep Creek	20191	0.00	1.05	0.00	0.17	0.87	0.00	0.17	2.7	9.0
Sheep Creek	77535	0.00	0.00	0.00	0.00	2.02	0.00	0.00	2.9	7.0
Spring Creek	31967	0.00	0.92	0.00	11.09	0.00	0.00	0.00	1.3	11.0
Spring Creek	64735	0.00	0.00	0.00	7.19	0.00	0.00	0.00	1.8	9.0
Spring Creek	74463	1.99	5.31	0.00	2.32	0.00	0.00	0.00	1.6	12.0
Squaw Creek	24383	0.00	0.52	0.00	4.68	2.08	0.00	0.00	1.9	11.0
Squaw Creek	32575	0.00	0.00	0.00	12.48	1.66	0.00	0.00	2.2	11.0
Squaw Creek	56543	0.44	0.44	0.00	2.63	0.00	0.00	0.00	1.5	10.0
Twin Creek	15839	0.00	0.00	0.00	0.00	5.96	0.00	0.00	1.8	10.0
Twin Creek	32223	0.00	0.00	0.00	0.00	3.79	0.00	0.00	2.9	9.0
Twin Creek	56799	0.00	0.00	0.00	0.00	7.00	0.00	0.00	2.2	9.0
Twin Creek	97759	0.00	0.00	0.00	0.00	3.90	0.00	0.00	2.1	8.0
Twin Creek	114143	0.00	0.00	0.00	0.00	4.25	0.00	0.00	1.8	8.0
Mean		1.01	2.15	0.63	3.84	0.88	0.58	0.39		
SD		2.25	3.26	2.40	4.91	1.64	3.20	1.50		

Table 10. Densities (fish/100m^2) of salmonids observed at extensive panel transects snorkeled in the Selway River steelhead population downstream of Marten Creek, July 23-August 26, 2009. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	Transect	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Whitefish	Visibility (m)	Temp (C)
Boyd Creek	113442	0.00	4.83	0.00	0.00	0.00	0.00	3.7	14.0
Buck Lake Creek	43074	0.00	17.56	7.15	0.00	0.00	0.00	3.6	12.5
Buck Lake Creek	146498	0.00	16.36	2.59	0.00	0.00	0.00	3.0	12.5
Buck Lake Creek	92226	0.00	11.78	0.00	0.00	0.00	0.00	3.0	12.5
Butte Creek	67650	0.00	0.00	0.00	4.42	0.00	0.00	3.3	9.0
Butte Creek	133186	0.00	5.21	7.29	0.00	0.00	0.00	2.6	9.0
Butter Creek	63554	0.00	0.00	0.00	3.29	0.82	0.00	2.2	6.0
Gedney Creek	14786	0.00	1.44	2.60	3.86	0.00	0.63	2.5	15.0
Gedney Creek	67010	0.00	2.74	10.70	6.54	0.00	0.28	2.7	15.0
Glover Creek	47554	0.00	0.00	1.62	5.93	0.00	0.00	2.2	13.0
Meadow Creek	3394	0.00	0.00	0.00	7.71	0.00	0.00	1.8	6.0
Meadow Creek	10306	0.00	8.01	6.59	0.00	0.00	0.00	3.0	17.0
Meadow Creek	30786	0.00	0.56	7.80	4.38	0.08	0.00	3.6	14.0
Meadow Creek	33346	0.00	7.00	2.01	0.00	0.00	0.00	2.5	-
Meadow Creek	40002	0.00	5.56	0.60	0.00	0.00	0.00	3.0	-
Meadow Creek	47170	0.00	0.81	84.07	3.74	1.14	0.00	2.0	14.0
Meadow Creek	64834	0.00	3.37	6.10	1.82	0.00	0.00	4.6	13.0
Meadow Creek	79938	0.00	4.66	33.60	0.69	0.00	0.00	-	13.0
Meadow Creek	80962	0.00	2.60	1.72	0.10	0.00	0.00	3.0	12.5
Meadow Creek	88514	0.00	0.85	5.28	0.28	0.00	0.00	1.6	15.0
Meadow Creek	104514	0.00	2.55	13.43	0.11	0.00	0.00	3.0	14.0
Meadow Creek	108610	0.00	0.79	0.42	0.00	0.00	0.00	-	12.0
Meadow Creek	154050	0.00	1.43	26.89	0.11	0.00	0.00	3.0	15.0
Mink Creek	40386	0.00	0.83	0.00	12.05	0.00	0.00	2.6	10.0
Mink Creek	144834	0.00	0.00	0.00	8.51	0.00	0.00	-	10.0
O'Hara Creek	87842	0.00	3.53	38.21	0.00	0.00	0.00	1.6	15.0
O'Hara Creek	123682	0.00	4.35	17.52	0.00	0.00	0.00	2.0	13.0
O'Hara Creek	152354	0.00	0.61	0.00	7.95	0.00	0.00	2.5	13.0
O'Hara Creek	54050	0.00	0.00	0.00	8.17	0.00	0.00	2.5	12.0
Pinchot Creek	77250	0.00	21.86	0.00	0.00	0.00	0.00	1.2	14.0
Rackliff Creek	63266	1.05	1.32	0.00	1.84	0.00	0.00	4.0	13.0
Simmons Creek	23618	0.00	2.25	0.00	0.00	0.00	0.00	-	9.0
Simmons Creek	89154	0.00	3.54	0.00	0.00	0.00	0.00	4.3	9.0
Three Links Creek	3522	0.00	0.00	0.00	10.46	0.00	0.00	4.8	-
Three Links Creek	93634	0.00	8.32	0.55	2.96	0.00	0.00	4.8	-
Three Links Creek	128450	0.00	11.97	0.00	3.39	0.00	0.00	1.2	-
Three Links Creek	36290	0.00	0.00	0.00	28.71	0.00	0.00	3.7	-
Mean		0.03	4.24	7.48	3.43	0.06	0.02		
SD		0.17	5.40	15.99	5.50	0.23	0.11		

Table 11. Densities (fish/100m^2) of salmonids observed at extensive panel sites snorkeled in the Potlatch River drainage in the lower mainstem Clearwater steelhead population, June 12-16, 2010. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species, but do not include dry sites.

Stream	Site	Trout Fry	Steelhead	Brook Trout	Visibility (m)	Temp (C)
Bear Creek	79842	0.00	0.00	0.00	0.6	20.0
Big Bear Creek	30690	0.00	0.00	0.00	0.9	18.0
Big Bear Creek	86034	0.00	0.00	0.00	-	7.5
Big Bear Creek	91154	0.00	15.08	0.00	1.1	19.0
Big Bear Creek	106514	0.00	0.00	0.00	1.1	12.0
Big Bear Creek	107538	3.65	0.24	0.00	0.8	19.0
Big Bear Creek	119826	0.00	0.00	0.00	1.0	20.5
Big Bear Creek	135186	0.00	0.00	0.00	-	7.0
Big Meadow Creek	12818	0.00	0.00	0.00	1.6	9.5
Bloom Creek	41954	0.00	0.00	0.00	-	7.5
Bloom Creek	78705	0.00	4.34	1.58	1.2	10.0
Bobs Creek	35697	0.00	0.00	0.52	1.7	9.0
Bobs Creek	37745	0.00	0.00	9.85	0.8	14.0
Bobs Creek	54129	0.00	0.00	6.28	2.2	13.0
Bobs Creek	86897	0.00	2.92	4.38	1.6	10.0
Bobs Creek	103281	0.00	0.55	6.88	2.1	14.0
Dry Creek	68114	0.00	0.00	0.00	-	9.5
Dry Creek	152594	0.00	0.00	0.00	0.5	10.5
EF Big Bear Cr	36882	0.00	4.93	0.00	0.7	11.0
EF Big Bear Cr	126946	0.00	7.74	0.00	0.9	11.0
EF Potlatch River	2929	0.33	4.94	3.30	1.0	11.5
EF Potlatch River	13169	0.00	5.77	10.42	0.9	14.0
EF Potlatch River	34786	0.10	0.73	0.00	1.4	15.5
EF Potlatch River	45937	0.00	3.43	5.25	2.3	13.5
EF Potlatch River	95089	0.00	0.49	4.43	1.1	10.0
EF Potlatch River	130018	0.00	0.78	0.59	0.5	13.0
EF Potlatch River	134001	2.49	5.65	1.81	1.0	13.0
EF Potlatch River	136049	0.00	7.18	1.26	1.9	15.0
EF Potlatch River	144241	0.00	2.76	4.97	1.0	13.5
EF Potlatch River	168817	0.00	0.00	0.00	1.5	9.0
EF Potlatch River	182242	0.00	2.05	0.24	1.1	17.0
Fry Creek	73698	0.00	0.00	0.00	-	8.0
Howell Creek	45074	0.00	0.00	0.00	0.7	12.0
Howell Creek	159762	0.00	0.00	0.00	-	12.0
Jackson Creek	26954	0.00	10.82	2.70	1.1	10.5
Jackson Creek	174050	0.00	0.00	0.00	1.8	12.5
Little Bear Creek	13330	0.00	6.19	0.00	0.6	16.0
Little Bear Creek	140306	0.00	0.74	0.00	0.8	17.0
Little Bear Creek	144402	3.57	4.82	0.00	0.7	13.0
Little Bear Creek	158226	0.00	0.71	0.00	0.9	17.0
Little Bear Creek	173074	0.00	3.54	0.00	1.2	13.0
MF Big Bear Cr	40978	0.00	0.35	0.00	0.9	16.0
MF Big Bear Cr	143378	0.00	0.00	0.00	-	16.0
Nora Creek	27154	0.00	0.00	0.00	0.9	11.0
Potlatch River	1	0.00	2.28	2.77	1.0	16.0
Potlatch River	18402	0.23	0.00	0.00	1.3	12.0
Potlatch River	83938	0.00	1.37	0.20	1.1	17.0
Potlatch River	116706	0.00	0.00	0.00	0.7	14.0
Potlatch River	149474	0.13	0.00	0.00	0.8	16.0
Randall Flat Creek	16914	0.00	0.00	0.00	-	9.0
Randall Flat Creek	119314	0.00	0.00	0.00	1.0	14.0
Ruby Creek	2018	0.00	1.29	0.77	1.3	15.0
Ruby Creek	67554	0.77	0.51	0.00	1.3	12.0
Ruby Creek	113634	1.78	7.13	0.59	1.0	12.0

Table 11. Continued.

Stream	Site	Trout Fry	Steelhead	Brook Trout	Visibility (m)	Temp (C)
Schwartz Creek	24594	0.60	3.57	0.00	1.1	8.0
Ruby Creek	31714	0.00	0.35	0.71	1.2	9.0
Schwartz Creek	28642	0.00	0.00	0.00	-	-
Schwartz Creek	57362	1.4	2.33	0.00	1.3	9.5
Spring Valley Creek	111122	0.00	3.83	0.00	1.7	16.0
WF Big Bear Cr	11147	0.00	0.00	0.00	-	8.0
WF Big Bear Cr	73746	0.00	0.00	0.00	2.0	15.0
WF Big Bear Cr	110610	0.00	0.00	0.00	0.6	11.0
WF Little Bear Cr	60434	2.72	1.21	0.00	1.0	9.0
WF Little Bear Cr	100882	0.00	0.32	0.00	1.7	15.0
WF Little Bear Cr	136210	0.67	0.89	0.00	1.0	9.0
Mean		0.27	1.87	0.98		
SD		0.80	2.97	2.22		

Table 12. Densities (fish/100m^2) of salmonids observed at extensive panel sites snorkeled in the Selway River steelhead population upstream of Marten Creek and downstream of Bear Creek, July 20-August 11, 2010. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Site**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Cedar Creek	72130	0.00	4.24	0.00	2.60	0.00	0.00	4.2	14.0
Double Creek	110274	0.00	0.36	0.00	11.90	0.00	0.00	4.5	14.0
EF Moose Creek	28354	0.00	4.62	1.16	0.87	0.00	0.00	4.5	18.0
EF Moose Creek	33089	0.00	6.49	0.12	0.84	0.00	0.00	3.8	14.0
EF Moose Creek	34369	0.00	1.37	0.00	5.92	0.00	0.00	5.1	15.5
EF Moose Creek	57665	0.00	1.62	7.25	1.76	0.00	2.32	4.5	16.0
EF Moose Creek	59842	0.00	1.05	1.5	2.14	0.00	0.00	4.3	16.0
EF Moose Creek	85698	0.00	0.47	0.35	0.94	0.00	0.00	3.1	15.0
Fitting Creek	93890	0.00	0.00	0.00	31.68	0.00	0.00	3.5	14.0
Lizard Creek	84930	0.00	0.00	0.00	1.02	0.00	0.00	5.0	14.0
Monument Creek	54914	0.00	8.50	0.00	3.07	0.00	0.00	4.0	13.0
NF Moose Creek	12738	0.00	0.00	0.00	7.45	0.00	0.00	3.1	14.0
NF Moose Creek	20162	0.00	1.80	0.32	0.08	0.00	0.00	3.0	18.5
NF Moose Creek	22210	0.00	0.00	0.00	4.98	0.00	0.00	3.2	17.0
NF Moose Creek	38594	0.00	1.23	5.05	1.35	0.00	0.00	3.2	15.0
NF Moose Creek	40642	0.00	11.40	0.95	2.07	0.18	0.83	3.8	14.0
NF Moose Creek	106178	0.00	10.19	1.14	1.69	0.00	0.99	3.0	18.0
Rhoda Creek	47810	0.00	0.00	0.00	4.16	0.00	0.00	4.0	10.5
Rhoda Creek	50882	0.00	1.20	0.00	4.15	0.00	0.00	3.0	14.0
Rhoda Creek	89794	0.00	7.62	0.00	0.67	0.00	0.00	4.5	13.0
Rhoda Creek	101314	0.57	0.00	0.00	10.66	0.00	0.00	4.0	13.0
Trout Creek	11970	0.00	0.00	0.00	6.12	0.00	0.00	2.3	11.0
W Moose Creek	70082	0.00	0.00	0.00	3.90	0.00	0.00	4.8	9.0
W Moose Creek	87746	0.00	0.00	0.00	11.35	0.00	0.00	3.3	15.5
W Moose Creek	90562	0.00	2.22	0.00	3.71	0.00	0.00	3.5	10.0
Wounded Doe Cr	1730	0.00	0.00	0.00	1.77	0.00	0.00	5.0	9.0
Wounded Doe Cr	96962	0.00	0.00	0.00	1.87	0.00	0.00	3.5	11.0
Mean		0.02	2.38	0.66	4.77	0.01	0.15		
SD		0.11	3.45	1.67	6.31	0.03	0.50		

Table 13. Densities (fish/100m^2) of salmonids observed at extensive panel sites snorkeled in the Panther Creek steelhead population, July 7-August 6, 2010. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density								
Stream	Site	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (C)
Beaver Creek	1759	0.00	3.44	0.00	0.29	0.00	0.00	0.00	1.7	12.0
Beaver Creek	47839	0.00	0.00	0.00	3.12	0.52	0.00	0.00	1.5	10.0
Beaver Creek	67295	0.00	3.68	0.00	0.00	0.00	0.00	0.00	1.7	11.0
Beaver Creek	80607	0.00	0.00	0.00	2.28	0.00	0.00	0.00	1.6	8.0
Beaver Creek	132831	0.00	2.29	0.00	0.00	0.00	0.38	0.00	2.7	10.0
Clear Creek	17055	0.00	11.34	0.00	0.00	0.00	0.00	0.00	2.7	13.0
Clear Creek	25247	1.76	2.20	0.00	0.15	0.00	0.00	0.00	3.1	12.5
Clear Creek	43743	0.00	13.49	11.18	0.00	0.18	0.00	1.06	1.6	15.0
Clear Creek	76511	0.12	8.55	1.04	0.00	0.00	0.00	1.39	1.8	12.0
Clear Creek	125663	0.00	3.63	0.64	0.00	0.21	0.00	2.35	2.0	12.5
Garden Creek	6879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	10.0
Garden Creek	8863	0.00	0.00	0.00	2.28	0.00	0.00	0.00	2.9	11.0
Garden Creek	41631	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	4.0
Panther Creek	16815	0.16	1.56	0.00	0.00	0.00	0.78	0.00	1.4	13.0
Panther Creek	47263	0.41	4.97	2.38	0.00	0.00	0.00	0.10	1.1	10.0
Panther Creek	57007	0.00	0.35	0.00	0.00	0.00	0.00	0.00	2.0	9.0
Panther Creek	83103	1.67	8.00	3.67	0.00	0.00	0.00	0.78	1.3	14.0
Panther Creek	84127	0.00	1.72	0.00	0.00	0.00	0.00	0.00	1.2	13.0
Trail Creek	19167	0.61	9.18	0.00	1.84	0.00	0.00	0.00	1.9	12.0
Trail Creek	84703	0.00	1.79	0.00	0.00	0.00	0.00	0.00	2.0	8.0
Trail Creek	94943	0.00	4.31	0.00	0.00	0.00	0.00	0.00	1.8	12.5
Mean		0.23	3.83	0.90	0.47	0.04	0.06	0.27		
SD		0.55	4.26	2.72	0.82	0.06	0.20	0.66		

Table 14. Densities (fish/100m^2) of salmonids observed at intensive panel transects snorkeled in the Crooked River drainage in the South Fork Clearwater River steelhead population, July 24-July 1, 2009. Mean and standard deviation are given by species.

		Density							
Stream	**Transect**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Crooked River	5698	1.37	0.00	0.46	0.00	0.00	0.18	1.7	13.5
Crooked River	50754	0.10	0.00	0.31	0.10	0.00	0.00	2.0	10.5
Crooked River	72258	1.57	0.00	0.00	0.12	0.24	0.00	2.6	10.0
Crooked River	73282	0.77	0.06	0.90	0.00	0.00	0.13	1.8	14.0
Crooked River	161346	1.34	0.09	0.27	0.09	0.09	0.36	1.7	10.0
Crooked River	202306	0.67	0.27	0.80	0.13	0.00	0.00	2.1	12.5
Crooked River	214594	0.67	0.00	0.19	0.00	0.00	0.10	1.8	8.5
Crooked River	243266	0.77	3.40	0.08	0.00	0.00	0.15	1.7	12.0
EF Crooked River	55874	2.26	0.00	0.00	0.75	1.51	0.00	2.6	7.5
EF Crooked River	219714	0.69	0.00	0.00	0.00	0.00	0.00	2.4	7.5
EF Relief Creek	58946	0.00	0.00	5.27	0.00	0.00	0.00	1.4	11.0
EF Relief Creek	132674*	0.00	0.00	0.00	0.00	0.00	0.00	-	10.0
EF Relief Creek	157250	0.00	0.00	8.91	0.00	0.00	0.00	1.8	9.0
EF Relief Creek	247362	0.00	0.00	1.45	0.00	0.00	0.00	1.2	8.5
Fivemile Creek	14914	0.00	0.00	5.20	0.00	0.00	0.00	1.9	8.0
Fivemile Creek	186946	0.00	0.00	4.83	0.00	0.00	0.00	1.7	10.0
Relief Creek	124482	0.00	0.00	5.69	0.00	0.00	0.00	1.8	9.0
Relief Creek	181826	0.27	0.00	1.60	0.00	0.00	0.27	2.9	12.5
Relief Creek	235074	6.85	0.00	0.00	0.00	0.00	0.00	1.6	8.0
WF Crooked River	105026	0.00	0.00	0.00	0.62	0.00	0.00	2.0	10.0
WF Crooked River	170562	0.00	0.00	0.00	0.94	0.00	0.00	2.0	9.0
WF Crooked River	178754	0.00	0.00	2.31	0.00	0.00	0.00	1.0	8.0
WF Crooked River	211522	0.14	0.00	4.41	0.00	0.00	0.00	1.0	11.0
WF Crooked River	236098	0.28	0.00	0.00	0.00	0.00	0.00	2.0	10.0
WF Crooked River	244290	0.33	0.00	2.61	0.65	0.00	0.00	3.0	8.0
WF Crooked River	256578	0.52	0.00	0.69	0.00	0.00	0.00	2.0	11.0
Mean		0.83	0.02	2.15	0.03	0.02	0.06		
SD		1.64	0.07	2.72	0.05	0.06	0.11		

*No water

Table 15. Densities (fish/100m^2) of salmonids observed at intensive panel transects snorkeled in the Crooked Fork Creek drainage in the Lochsa River steelhead population, July 8-15, 2009. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Boulder Creek	34625	0.00	2.98	0.00	0.72	0.10	0.00	3.0	11.5
Brushy Fork	21313	0.23	0.23	0.00	0.23	0.00	0.00	3.4	15.0
Brushy Fork	103233	0.00	0.87	3.15	0.40	0.00	0.20	-	18.0
Brushy Fork	117569	0.00	2.49	8.00	1.28	0.00	0.00	3.5	14.0
Brushy Fork	136001	0.00	0.63	0.63	0.40	0.00	0.00	2.5	18.0
Brushy Fork	150337	0.00	2.47	4.31	1.20	0.00	0.00	3.5	15.0
Crooked Fork	10049	0.00	0.00	0.00	7.14	0.00	0.00	3.0	12.0
Crooked Fork	12097	0.38	1.41	5.11	1.32	0.00	0.00	3.7	15.5
Crooked Fork	28481	0.00	1.12	0.10	0.97	0.00	0.00	-	14.0
Crooked Fork	48961	0.00	1.08	0.43	0.86	0.00	0.00	3.0	10.0
Crooked Fork	64321	0.00	1.31	3.13	0.51	0.00	0.65	3.2	15.0
Crooked Fork	67393	0.00	0.19	0.00	0.00	0.00	0.00	3.2	11.0
Crooked Fork	80705	0.00	0.00	0.00	8.30	0.00	0.00	2.6	10.5
Crooked Fork	94017	0.00	2.91	7.07	2.22	0.00	0.68	3.5	18.0
Crooked Fork	97089	0.00	0.24	2.94	0.06	0.00	0.06	3.0	14.5
Crooked Fork	122689	0.00	0.00	0.00	8.39	0.21	0.00	2.6	10.0
Crooked Fork	132929	0.00	0.23	1.07	0.54	0.00	0.00	3.2	-
Crooked Fork	151361	0.00	1.25	2.50	0.80	0.00	0.06	3.0	15.5
Crooked Fork	159553	0.44	1.97	4.91	1.66	0.00	0.18	3.7	15.0
Crooked Fork	165697	0.00	1.03	3.61	0.52	0.00	0.00	4.0	9.0
Spruce Creek	111425	0.00	0.57	0.00	0.80	0.11	0.00	2.5	13.0
Spruce Creek	123969	0.00	0.47	0.00	0.23	0.00	0.00	3.1	12.0
Mean		0.05	1.07	2.13	1.75	0.02	0.08		
SD		0.13	0.96	2.51	2.58	0.05	0.20		

Table 16. Densities (fish/100m^2) of salmonids observed at intensive panel sites snorkeled in the Marsh Creek drainage in the Middle Fork Salmon River upper mainstem steelhead population, July 22-26, 2010. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density								
Stream	Site	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (C)
Bear Creek	109911	0.00	0.57	0.00	0.00	0.57	1.14	0.00	2.7	11.0
Beaver Creek	11607	0.83	0.26	5.80	0.05	0.00	0.31	0.10	3.0	12.0
Beaver Creek	15703	0.00	1.39	1.61	0.00	0.00	1.39	0.11	4.6	11.0
Beaver Creek	27991	0.00	0.66	1.90	0.00	0.00	0.22	1.10	2.5	10.0
Beaver Creek	32111	0.00	0.00	0.00	0.00	0.63	0.00	0.00	2.7	7.0
Beaver Creek	51031	0.00	1.95	0.00	0.00	0.16	0.00	0.00	3.2	10.0
Beaver Creek	83799	0.00	0.30	0.00	0.00	0.30	0.61	0.00	3.8	8.0
Beaver Creek	97111	0.00	0.00	0.00	0.00	0.87	0.43	0.00	3.9	10.0
Bench Creek	101719	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	8.0
Cape Horn Creek	150871	0.00	0.09	7.14	0.00	0.00	0.09	0.27	2.9	12.0
Knapp Creek	40279	0.76	0.00	0.00	0.00	0.00	0.38	0.00	3.5	11.0
Knapp Creek	60759	4.79	2.44	1.78	0.00	0.00	11.08	0.19	3.0	16.0
Knapp Creek	73047	0.00	0.50	0.20	0.00	0.00	1.30	0.00	3.9	12.0
Knapp Creek	126295	0.00	1.19	0.15	0.00	0.00	0.74	0.15	3.6	11.0
Knapp Creek	130391	0.00	0.57	0.00	0.00	0.00	2.55	0.28	2.9	13.0
Knapp Creek	164695	0.00	0.15	0.00	0.00	0.00	0.00	0.00	4.5	7.0
Lola Creek	60247	0.00	0.35	0.00	0.00	1.40	0.70	0.00	3.2	9.0
Marsh Creek	56663	0.51	0.00	2.36	0.00	0.62	0.00	0.00	5.0	10.0
Marsh Creek	89431	3.44	0.11	0.33	0.00	0.00	0.11	0.22	2.7	11.0
Marsh Creek	105815	0.00	6.58	0.58	0.23	0.00	0.12	1.85	3.2	11.0
Marsh Creek	125783	0.49	4.32	5.24	0.00	0.06	0.06	0.56	3.4	11.5
Swamp Creek	21847	0.00	0.42	0.00	0.00	0.00	0.00	0.00	3.1	15.0
Swamp Creek	120151	0.00	0.00	0.00	0.00	0.00	0.35	0.00	3.7	8.0
Winnemucca Creek	18263	0.51	0.00	0.00	0.00	0.25	1.01	0.00	3.0	9.5
Winnemucca Creek	123735	0.00	0.00	0.00	0.00	0.00	0.44	0.00	2.8	9.0
Winnemucca Creek	141143	0.00	0.00	0.00	0.00	0.64	0.00	0.00	3.0	7.0
Mean		0.44	0.84	1.04	0.01	0.21	0.89	0.19		
SD		1.13	1.53	1.99	0.05	0.36	2.16	0.42		

Table 17. Densities (fish/100m^2) of salmonids observed at intensive panel sites snorkeled in the Crooked River drainage in the South Fork Clearwater River steelhead population, June 23-July 15, 2010. Mean and standard deviation are given by species.

Stream	Site	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (C)
Crooked River	5698	0.00	0.76	0.00	0.30	0.00	0.00	0.00	2.1	11.0
Crooked River	50754	0.00	0.37	0.00	0.18	0.00	0.00	0.00	2.8	12.0
Crooked River	72258	0.00	0.82	0.00	0.96	0.14	0.14	0.14	1.7	10.0
Crooked River	73282	0.00	0.45	0.00	0.00	0.00	0.00	0.00	1.8	12.5
Crooked River	161346	0.00	0.32	1.27	0.38	0.00	0.06	1.46	2.4	13.5
Crooked River	202306	0.00	1.07	0.00	0.59	0.00	0.00	0.12	1.5	9.5
Crooked River	214594	0.00	0.45	0.00	0.45	0.00	0.00	0.00	1.6	10.0
Crooked River	243266	0.00	1.09	0.00	0.31	0.00	0.31	0.00	1.7	15.0
EF Crooked River	55874	0.00	0.53	0.00	1.46	0.66	0.00	0.00	2.0	8.0
EF Crooked River	219714	0.00	0.32	0.00	1.78	0.16	0.00	0.00	1.7	8.0
EF Relief Creek	58946	0.00	1.05	0.00	0.79	0.00	0.00	0.00	1.1	11.5
EF Relief Creek	132674	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	8.0
EF Relief Creek	157250	0.00	2.13	0.00	3.42	0.00	0.00	0.00	3.1	10.0
EF Relief Creek	247362	0.00	0.00	0.00	1.45	0.00	0.00	0.00	1.2	8.5
Fivemile Creek	14914	0.00	0.00	0.00	2.83	0.00	0.00	0.00	1.8	9.0
Fivemile Creek	186946	0.00	0.00	0.00	3.78	0.00	0.00	0.00	1.7	10.0
Relief Creek	124482	0.57	0.00	0.00	10.53	0.00	0.00	0.00	1.9	8.0
Relief Creek	181826	0.00	1.89	0.00	2.59	0.00	0.00	0.00	1.4	13.0
Relief Creek	235074	0.00	0.36	0.00	1.43	0.00	0.00	0.00	3.3	5.0
WF Crooked River	105026	0.00	0.00	0.00	0.40	1.59	0.00	0.00	1.7	8.0
WF Crooked River	170562	0.00	0.36	0.00	0.00	0.00	0.00	0.00	1.6	6.0
WF Crooked River	178754	0.00	0.46	0.00	2.77	0.15	0.00	0.00	2.3	10.5
WF Crooked River	211522	0.00	0.22	0.00	4.83	0.00	0.00	0.00	1.5	10.0
WF Crooked River	236098	0.00	0.33	0.00	0.49	2.28	0.33	0.00	2.0	10.0
WF Crooked River	244290	0.00	0.69	0.00	0.69	0.29	0.00	0.00	1.8	10.5
WF Crooked River	256578	0.00	0.16	0.00	2.58	0.48	0.00	0.16	1.3	11.0
Mean		0.02	0.53	0.05	1.73	0.22	0.03	0.07		
SD		0.11	0.55	0.25	2.23	0.54	0.09	0.29		

*No water

Table 18. Densities (fish/100m^2) of salmonids observed at intensive panel sites snorkeled in the Crooked Fork Creek drainage in the Lochsa River steelhead population, July 21-28, 2010. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Site**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Boulder Creek	193	0.00	0.00	0.00	0.00	0.00	0.00	3.7	13.0
Boulder Creek	34625	0.11	1.75	0.00	2.51	0.22	0.00	4.2	12.0
Boulder Creek	131265	0.00	0.00	0.00	0.00	0.00	0.00	3.4	11.0
Brushy Fork	21313	0.00	1.28	0.00	0.09	0.00	0.09	2.4	12.0
Brushy Fork	101185	0.00	1.93	2.66	0.00	0.06	0.00	4.9	9.0
Brushy Fork	103233	0.00	2.31	0.00	0.00	0.00	0.26	3.6	11.5
Brushy Fork	117569	0.00	3.05	1.02	0.34	0.17	0.00	3.3	11.5
Brushy Fork	136001	0.00	2.76	0.35	0.07	0.00	0.00	4.5	16.0
Brushy Fork	150337	0.00	3.61	1.11	0.21	0.00	0.00	3.0	10.5
Crooked Fork	10049	0.00	1.84	0.00	6.39	0.25	0.00	4.3	-
Crooked Fork	12097	0.04	4.97	1.33	0.59	0.00	0.08	3.2	11.0
Crooked Fork	28481	0.00	2.08	0.28	0.61	0.00	0.12	3.6	13.0
Crooked Fork	48961	0.00	1.16	0.00	1.41	0.00	0.00	4.3	10.0
Crooked Fork	64321	1.38	0.09	0.92	0.46	0.09	0.46	3.1	15.0
Crooked Fork	67393	0.15	0.15	0.05	0.00	0.00	0.10	4.6	10.0
Crooked Fork	80705	0.00	1.16	0.00	8.54	0.00	0.00	0.0	0.0
Crooked Fork	94017	0.00	1.90	0.57	0.76	0.00	0.52	3.6	12.0
Crooked Fork	97089	4.13	0.00	0.15	0.23	0.00	0.00	3.1	15.0
Crooked Fork	122689	0.00	0.00	0.00	6.76	0.00	0.00	3.0	11.0
Crooked Fork	132929	0.00	0.41	0.00	0.18	0.00	0.28	4.0	15.0
Crooked Fork	151361	0.00	0.06	0.80	0.06	0.00	0.00	3.1	10.0
Crooked Fork	159553	0.00	4.04	0.57	0.36	0.00	0.78	2.8	13.0
Crooked Fork	165697	0.00	1.01	0.00	1.11	0.00	0.00	3.4	9.5
Hopeful Creek	105281	0.00	0.66	0.00	2.19	0.22	0.00	4.0	10.0
Spruce Creek	111425	0.00	2.28	0.00	1.61	0.00	0.00	2.2	12.0
Spruce Creek	123969	0.00	1.18	0.00	0.12	0.00	0.00	3.2	11.0
Mean		0.22	1.53	0.38	1.33	0.04	0.10		
SD		0.84	1.36	0.63	2.30	0.08	0.20		

Table 19. Densities (fish/100m^2) of salmonids observed at core and non-core trend transects snorkeled in the Salmon River steelhead major population group during 2009. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout.

		Density										
Stream	Transect	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/ Bull Hybrid	Cut/Steel Hybrid	Visibility (m)	Temp (C)
Alturas Lake Creek	2B	0.00	0.00	5.27	0.00	0.00	0.65	0.55	0.00	0.00	2.0	21.0
Bargamin Creek	2	0.14	6.41	0.00	0.56	0.14	0.00	0.42	0.00	0.00	1.7	-
Bargamin Creek	1	0.39	3.78	0.00	0.54	0.08	0.00	0.31	0.00	0.00	2.1	14.0
Bear Valley Creek	A	0.00	0.15	8.28	0.00	0.00	0.08	13.03	0.00	0.00	1.7	12.0
Bear Valley Creek	B	0.00	0.00	0.02	0.00	0.00	0.00	0.19	0.00	0.00	1.3	9.5
Beaver Creek	1/A	0.95	1.78	3.28	0.22	0.06	0.06	0.28	0.00	0.00	2.9	13.0
Beaver Creek	3/B	0.00	0.45	9.10	0.00	0.00	0.63	0.00	0.00	0.00	2.6	15.0
Big Creek	L1	0.00	0.32	1.29	0.54	0.00	0.00	0.11	0.00	0.00	2.5	11.0
Big Creek	Logan Cr	0.00	1.12	3.63	0.47	0.19	0.19	0.19	0.09	0.00	2.3	9.0
Big Creek	Cabin Cr	0.00	0.28	0.67	0.36	0.04	0.00	0.40	0.00	0.04	2.7	12.0
Big Creek	Taylor 1	0.00	0.16	1.34	0.47	0.02	0.00	1.45	0.00	0.02	1.8	17.5
Big Springs Creek	BSC Bridge	0.00	0.68	0.68	0.14	0.00	0.00	0.00	0.00	0.00	1.9	15.0
Boulder Creek	1	0.00	0.90	0.00	0.00	0.18	0.54	0.00	0.00	0.00	2.1	13.0
Boulder Creek	2	0.00	3.57	0.00	0.00	0.12	0.35	0.00	0.00	0.00	1.6	12.0
Boulder Creek	3	0.36	18.94	11.66	0.00	0.36	0.36	0.00	0.00	0.00	1.8	12.0
Boulder Creek	5	0.69	12.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	9.0
Camas Creek	L1-Mouth	0.00	1.05	0.35	3.86	0.00	0.00	3.33	0.00	0.00	1.9	14.0
Camas Creek	Upper	0.00	1.42	0.00	0.71	0.00	0.00	0.71	0.00	0.00	1.9	14.0
Cape Horn Creek	1/A	0.00	0.00	71.29	0.00	0.00	1.70	0.00	0.00	0.00	2.8	12.5
Cape Horn Creek	2/B	0.00	0.00	62.09	0.00	0.14	0.27	0.00	0.00	0.00	2.2	13.5
Chamberlain Creek	CHA4	0.45	3.80	29.02	0.00	0.00	0.00	1.34	0.00	0.00	2.2	15.0
Chamberlain Creek	CHA1	10.30	11.98	99.38	0.00	0.42	0.00	3.78	0.00	0.00	3.0	15.0
EFSF Salmon River	Sugar Cr	0.00	1.25	0.00	0.00	0.78	0.00	0.63	0.00	0.00	2.1	-
EFSF Salmon River	3	0.00	3.72	0.00	0.00	0.00	0.00	0.23	0.00	0.00	1.2	10.0
EFSF Salmon River	6	0.43	0.26	3.06	0.31	0.05	0.00	3.18	0.00	0.00	2.2	12.0
EFSF Salmon River	7	0.00	3.32	2.88	0.58	0.00	0.14	1.87	0.00	0.00	2.0	13.0
Elk Creek	2A	0.00	0.00	25.37	0.00	0.00	0.00	0.71	0.00	0.00	2.1	10.0
Elk Creek	2B	0.00	0.31	57.91	0.00	0.00	0.10	6.37	0.00	0.00	1.6	-
Elk Creek	1A	0.00	0.07	35.64	0.00	0.00	0.15	10.35	0.00	0.00	1.5	13.0
Elk Creek	1B	0.00	0.66	17.22	0.00	0.00	0.31	11.70	0.00	0.00	1.8	12.5
Hannah Slough	UPS Garden Cr	28.88	0.72	298.69	0.60	0.00	0.00	22.62	0.00	0.00	1.8	14.0
Hazard Creek	HAZ1	1.04	11.86	0.40	0.72	0.08	0.00	0.00	0.00	0.00	1.9	15.0
Horse Creek	L2	2.00	4.28	0.09	0.00	0.00	0.00	0.46	0.00	0.00	1.9	12.5
Horse Creek	L1	0.69	6.74	1.56	0.17	0.35	0.00	0.35	0.00	0.00	1.8	12.0
Indian Creek	Lower	0.00	1.37	1.64	0.55	0.00	0.00	0.27	0.00	0.00	2.4	17.0
Indian Creek	Upper	0.00	2.47	7.95	0.00	0.00	0.00	1.64	0.00	0.00	2.4	17.0
Johnson Creek	M1	0.00	0.00	0.00	0.00	0.00	1.26	0.00	0.00	0.00	1.4	14.0
Johnson Creek	M2	0.00	0.13	0.00	0.00	0.00	1.88	0.00	0.00	0.00	1.9	15.0
Johnson Creek	M3	0.00	0.00	0.00	0.00	0.00	1.03	0.00	0.00	0.00	1.3	12.0
Johnson Creek	PW1A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	10.0
Johnson Creek	PW3A	0.00	7.06	0.00	0.09	0.00	0.00	0.00	0.00	0.00	1.3	-

Table 19. Continued.

Stream	Transect	Density: Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/ Bull Hybrid	Cut/Steel Hybrid	Visibility (m)	Temp (C)
Johnson Creek	PW3B	0.00	2.10	0.00	0.06	0.00	0.00	0.12	0.00	0.00	2.0	10.0
Johnson Creek	L3	2.47	3.19	14.40	0.00	0.05	0.00	0.49	0.00	0.00	2.0	15.0
Johnson Creek	L2	0.54	7.40	4.46	0.00	0.11	0.00	0.11	0.00	0.00	1.6	14.0
Lake Creek	Willow Cr	0.29	0.00	7.60	0.00	0.00	0.00	0.00	0.00	0.00	1.4	9.0
Lake Creek	Burgdorf	0.10	0.00	9.17	0.00	0.00	0.00	0.07	0.00	0.00	1.6	9.0
Lemhi River	Lem2B	0.00	8.87	0.64	0.00	0.00	0.00	0.40	0.00	0.00	3.1	11.0
Lick Creek	L3	0.00	8.63	0.00	0.29	0.00	0.43	0.29	0.00	0.00	2.5	13.0
Lick Creek	L1	0.39	0.31	0.00	0.00	0.00	0.00	0.16	0.00	0.00	2.8	12.0
Little Salmon River	1	9.00	4.67	6.34	0.00	0.00	0.00	0.00	0.00	0.00	1.5	15.0
Little Salmon River	2	0.34	2.93	5.91	0.00	0.00	0.00	0.34	0.00	0.00	1.8	16.0
Loon Creek	L1-Bridge	0.00	0.00	0.00	3.92	0.00	0.00	2.49	0.00	0.00	1.8	14.0
MF Salmon River	Big Cr Bridge	0.00	0.00	0.00	0.54	0.00	0.00	0.54	0.00	0.00	2.5	16.0
MF Salmon River	Boundary	0.00	0.23	2.65	0.82	0.04	0.04	0.78	0.00	0.00	2.5	15.0
MF Salmon River	Cliffside Rapid Hole	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	3.4	17.0
MF Salmon River	Cougar	0.00	0.00	0.63	0.63	0.00	0.00	2.81	0.00	0.00	3.2	20.0
MF Salmon River	Elkhorn	0.00	6.03	1.89	1.51	0.00	0.00	4.15	0.00	0.00	3.9	16.0
MF Salmon River	Flying B	0.00	0.00	0.00	2.22	0.00	0.00	0.22	0.00	0.00	3.0	17.0
MF Salmon River	Gardells Hole	0.00	3.84	4.37	1.19	0.00	0.00	0.79	0.00	0.00	3.0	15.0
MF Salmon River	Goat Cr Pool	0.00	0.00	0.00	0.13	0.00	0.00	0.40	0.00	0.00	2.8	20.0
MF Salmon River	Goat Cr Run	0.00	0.15	0.00	0.15	0.00	0.00	0.29	0.00	0.00	2.8	20.0
MF Salmon River	Greyhound	0.00	0.54	0.00	6.49	0.00	0.00	5.41	0.00	0.00	2.8	17.0
MF Salmon River	Hancock Rapid Hole	0.00	0.00	0.00	0.26	0.00	0.00	0.26	0.00	0.00	3.2	18.0
MF Salmon River	Hospital Pool	0.00	0.00	0.00	2.46	0.00	0.00	0.89	0.00	0.00	2.8	16.0
MF Salmon River	Hospital Run	0.00	0.27	0.00	0.27	0.00	0.00	0.54	0.00	0.00	2.8	16.0
MF Salmon River	Indian	0.00	0.74	0.00	2.37	0.00	0.00	1.15	0.00	0.00	2.7	17.0
MF Salmon River	Little Guard Station	0.00	0.98	0.00	10.29	0.00	0.00	3.19	0.00	0.00	2.4	17.0
MF Salmon River	Little Ouzel	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00	3.4	17.0
MF Salmon River	Love Bar	0.00	0.34	0.00	2.24	0.00	0.00	0.17	0.00	0.00	2.9	17.0
MF Salmon River	Lower Jackass	0.00	0.21	0.00	0.28	0.00	0.00	1.27	0.00	0.00	3.2	18.0
MF Salmon River	Mahoney Camp	0.00	0.00	0.00	2.19	0.00	0.00	0.63	0.00	0.00	3.2	20.0
MF Salmon River	Marble Pool	0.00	0.21	0.00	1.07	0.00	0.00	0.85	0.00	0.00	3.3	14.0
MF Salmon River	Otter Bar	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	18.0
MF Salmon River	Pungo	0.00	1.30	6.49	3.03	0.00	0.00	1.73	0.00	0.00	3.0	16.0
MF Salmon River	Rapid River	0.00	3.09	4.63	5.02	0.00	0.00	9.27	0.00	0.00	3.5	10.0
MF Salmon River	Rock Island	0.00	0.00	0.85	0.28	0.00	0.00	0.57	0.00	0.00	2.9	15.0
MF Salmon River	Sheepeater	0.00	0.32	0.32	1.74	0.00	0.00	1.58	0.00	0.00	3.1	16.0
MF Salmon River	Ship Island	0.00	0.00	0.00	1.04	0.00	0.00	1.55	0.00	0.00	2.3	19.0
Marble Creek	L1	0.00	0.71	0.00	0.71	0.00	0.00	0.36	0.00	0.00	2.2	14.0
Marble Creek	MAR1B	0.66	17.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	12.0
Marble Creek	MAR1	0.74	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	13.0
Marble Creek	MAR2	0.20	0.40	0.00	0.60	0.20	0.00	0.40	0.00	0.20	2.3	10.0
Marsh Creek	4B	1.51	0.05	4.37	0.00	0.00	0.15	0.20	0.00	0.00	2.6	13.5
Marsh Creek	5A	2.92	0.87	25.57	0.00	0.00	1.74	0.55	0.00	0.00	4.5	17.5
Marsh Creek	MCIA	0.96	1.23	10.91	0.27	0.21	0.00	1.34	0.00	0.00	2.8	12.0
Monumental Creek	MON1	0.95	7.20	0.00	0.27	0.41	0.00	0.27	0.00	0.00	2.0	14.0

Table 19. Continued.

Stream	Transect	Density: Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/ Bull Hybrid	Cut/Steel Hybrid	Visibility (m)	Temp (C)
Monumental Creek	MON2	0.00	15.81	0.00	0.00	0.00	0.00	0.39	0.00	0.00	1.6	16.0
Monumental Creek	MON3	0.72	9.60	0.72	0.14	0.00	0.00	0.00	0.00	0.00	2.1	15.0
Monumental Creek	MON5	0.00	0.43	1.86	0.29	0.00	0.00	0.29	0.00	0.00	1.8	13.0
NF Salmon River	Dahlonega	10.46	2.95	3.09	2.32	0.00	0.14	0.07	0.00	0.00	2.0	11.0
NF Salmon River	Hughes	1.58	0.96	0.26	4.56	0.00	0.88	2.37	0.00	0.00	2.4	12.0
Pahsimeroi River	Dowton Lane	5.28	19.91	47.28	0.60	0.00	2.99	5.67	0.00	0.00	1.8	14.0
Pahsimeroi River	Ponds	5.95	16.16	34.36	0.00	0.00	1.36	5.61	0.00	0.00	1.6	14.0
Pahsimeroi River	Weir	0.00	7.12	61.09	0.17	0.00	0.00	3.30	0.00	0.00	1.5	16.0
Panther Creek	PC6	0.00	2.75	8.49	0.00	0.12	0.12	1.32	0.00	0.00	1.0	12.0
Panther Creek	PC9	0.00	6.10	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.9	13.0
Panther Creek	US Cabin Cr	0.00	0.67	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.8	9.5
Pistol Creek	Lower	0.00	0.00	2.48	3.47	0.00	0.00	1.98	0.00	0.00	3.6	14.0
Pistol Creek	Upper	0.00	1.04	0.00	1.74	0.00	0.00	1.39	0.00	0.00	3.6	14.0
Rapid River	Castle Cr	0.00	4.08	0.00	0.00	0.63	0.00	0.00	0.00	0.00	2.0	11.0
Rapid River	Cliff Hang	0.59	3.56	0.00	0.37	0.00	0.00	0.00	0.00	0.00	2.9	12.0
Rapid River	Copper Cr	0.00	2.02	0.00	0.00	0.74	0.00	0.00	0.00	0.00	1.9	12.0
Rapid River	Cora Cliff	0.60	5.14	0.40	0.00	0.00	0.00	0.00	0.00	0.00	2.8	13.5
Rapid River	Paradise	0.00	2.51	0.00	0.00	0.70	0.00	0.00	0.00	0.00	2.4	9.5
SF Salmon River	Stolle 1	0.00	0.00	1.27	0.00	0.07	0.00	1.20	0.00	0.00	1.3	11.0
SF Salmon River	Stolle 2	0.00	0.00	0.08	0.00	0.08	0.00	0.98	0.00	0.00	1.2	12.0
SF Salmon River	5	0.00	0.00	2.70	0.00	0.08	0.30	0.00	0.00	0.00	1.0	10.0
SF Salmon River	7	0.00	7.20	15.76	0.00	0.00	0.00	0.68	0.00	0.00	2.0	19.0
SF Salmon River	Poverty	2.42	0.27	24.75	0.00	0.00	0.00	0.18	0.00	0.00	1.8	20.0
SF Salmon River	11	2.83	2.32	27.86	0.00	0.00	0.00	1.31	0.00	0.00	1.7	19.0
SF Salmon River	14	3.02	0.98	15.86	0.03	0.03	0.00	1.96	0.00	0.00	1.8	18.0
SF Salmon River	16	0.26	0.74	0.57	0.00	0.02	0.00	0.40	0.00	0.00	1.6	16.0
SF Salmon River	Blw Hamilton	0.01	0.44	1.53	0.01	0.00	0.00	1.13	0.00	0.00	1.9	15.0
SF White Bird Creek	SF-#2	0.30	7.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	16.0
Salmon River	3/BRA	1.33	0.19	6.90	0.00	0.00	0.00	1.95	0.00	0.00	3.5	14.5
Sand Creek	M2	0.40	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	1.0	12.0
Secesh River	Grouse	0.00	0.64	4.27	0.00	0.00	0.11	0.21	0.00	0.00	2.0	10.0
Secesh River	Long Gulch	0.00	0.00	7.08	0.00	0.00	0.05	0.54	0.00	0.00	2.3	9.0
Slate Creek	6	0.29	1.93	0.07	0.00	0.07	0.00	0.00	0.00	0.00	1.4	12.0
Slate Creek	4	0.31	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	12.0
Slate Creek	3	3.38	8.21	1.34	0.00	0.10	0.00	0.00	0.00	0.00	2.5	13.0
Slate Creek	2	0.31	4.78	0.21	0.00	0.00	0.00	0.31	0.00	0.00	1.2	13.0
Slate Creek	1	0.65	9.94	5.71	0.00	0.16	0.00	0.00	0.00	0.00	2.0	17.0
Valley Creek	3B/MM Ranch	1.94	0.68	19.72	0.00	0.00	0.91	2.85	0.00	0.00	4.0	13.0
Valley Creek	UC11-B	0.94	2.12	39.67	0.00	0.16	0.00	12.33	0.00	0.00	2.4	15.0
WF Chamberlain Creek	CHA3	0.00	1.69	5.50	0.00	0.00	0.00	0.00	0.21	0.00	2.3	10.0
WF Chamberlain Creek	CHA2	0.28	2.61	24.63	0.00	3.44	0.00	0.00	0.00	0.00	2.9	10.0
WF Monumental Creek	MON4	0.00	1.45	0.58	0.19	0.00	0.00	0.10	0.10	0.00	2.8	14.0
White Bird Creek	1	0.00	5.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	15.0

Table 20. Densities (fish/100m^2) of salmonids observed at core and non-core trend transects snorkeled in the Clearwater River steelhead major population group during 2009. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout.

		Density											
Stream	Transect	Trout Fry	Steelhead	Hatchery Steelhead	Chinook Salmon	Hatchery Chinook	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Cut/Steel Hybrid	Visibility (m)	Temp (C)
American River	1-2.25U	0.00	0.00	0.00	37.69	0.00	0.00	0.00	0.00	0.19	0.00	-	10.0
American River	1-2.65U	0.00	0.00	0.00	32.92	0.00	1.40	0.00	0.56	1.12	0.00	-	12.0
American River	1-Gravel Pit	0.00	0.00	0.00	69.60	0.00	0.00	0.00	0.00	14.05	0.00	-	6.5
American River	2_Guntley's	0.00	0.00	0.00	8.16	1.92	0.48	0.00	0.00	2.40	0.00	2.4	13.0
American River	2-1/8 M Above E Fk	0.00	0.00	0.00	30.35	0.00	0.00	0.00	0.00	4.62	0.00	1.3	13.0
American River	2-FlatIron	0.00	0.00	0.00	31.25	0.00	1.23	0.00	0.00	0.41	0.00	2.4	9.5
American River	3-.5 MI Below Boxsing	0.00	5.00	0.00	156.06	0.00	1.50	0.00	0.00	5.00	0.00	2.2	13.0
American River	3-2 (American)	0.00	1.66	0.55	38.71	0.00	0.14	0.00	0.00	0.41	0.00	2.0	11.0
American River	3-Buffalo Pit	0.00	0.58	2.51	23.94	0.00	0.77	0.00	0.19	0.39	0.00	1.1	10.5
Bear Creek	1	0.00	0.21	0.00	0.55	0.00	0.21	0.00	0.00	0.14	0.00	-	15.0
Crooked Fork	1-2A	0.00	0.00	0.00	0.00	0.00	6.24	0.00	0.00	0.00	0.00	2.9	9.5
Crooked Fork	2-4A	0.00	0.00	0.00	0.00	0.00	11.31	0.00	0.00	0.00	0.00	3.0	10.0
Crooked Fork	4-1B	0.00	0.05	0.00	2.42	0.00	0.10	0.05	0.00	0.30	0.00	1.0	14.0
Crooked River	1-control 2	0.00	0.64	0.00	0.00	0.00	0.55	0.00	0.00	0.00	0.00	-	12.5
Crooked River	1-Sill-Log-B	0.00	1.07	0.00	0.00	0.00	1.96	0.18	0.00	0.71	0.18	1.9	9.5
Crooked River	1-Sill-Log-B	0.00	1.78	0.00	1.49	0.00	0.10	0.10	0.00	0.00	0.00	2.0	12.0
Crooked River	2-Control2	0.00	0.12	0.00	0.00	0.00	1.24	0.00	0.25	0.00	0.00	0.8	10.5
Crooked River	2-Treat2	0.00	0.81	0.00	0.35	0.00	2.19	0.00	0.00	0.00	0.00	0.5	10.0
Crooked River	C-Can2	0.00	0.71	0.00	0.00	0.00	0.18	0.00	0.00	0.18	0.00	1.9	10.0
Crooked River	C-Can3	0.00	1.13	0.00	1.42	0.00	0.14	0.00	0.00	0.42	0.00	1.8	9.0
Crooked River	Meander 1	0.00	2.89	0.00	22.98	0.00	0.61	0.00	0.26	0.18	0.00	-	13.0
Crooked River	Natural 3	0.00	1.22	0.00	11.73	0.00	0.09	0.00	0.17	0.96	0.00	-	11.0
Deep Creek	Cactus	0.00	0.20	0.00	2.35	0.00	6.47	0.00	0.00	0.00	0.00	-	16.0
Deep Creek	Scimitar	0.00	0.00	0.00	16.72	0.00	7.87	0.00	0.00	0.20	0.00	-	16.50
EF Crooked River	H-EF1	0.00	0.00	0.00	0.00	0.00	2.07	0.15	0.00	0.00	0.00	3.0	6.5
EF Crooked River	H-EF2	0.00	2.08	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	2.4	8.5
EF Potlatch River	PFI1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.27	0.00	0.00	0.3	12.0
EF Potlatch River	PFI2	0.00	4.29	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	1.0	14.0
EF Potlatch River	PFI3	0.00	14.78	0.00	0.00	0.00	0.00	0.00	4.93	0.00	0.00	1.0	14.0
EF Potlatch River	PFI4	0.00	5.24	0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.8	14.0
EF Potlatch River	PFI5	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.4	15.0
EF Potlatch River	PFI6	0.36	0.36	0.00	0.00	0.00	0.00	0.00	1.09	0.00	0.00	1.0	10.5
EF Potlatch River	PFI7	0.00	2.12	1.41	0.00	0.00	0.00	0.00	6.36	0.00	0.00	1.0	13.5
EF Potlatch River	PFI8	0.00	6.95	0.00	0.00	0.00	0.00	0.00	4.96	0.00	0.00	1.0	13.5
EF Potlatch River	PFI9	0.00	4.29	0.00	0.00	0.00	0.00	0.00	4.68	0.00	0.00	1.0	13.5
EF Moose Creek	3	0.46	2.42	0.00	1.55	0.00	0.41	0.00	0.00	0.00	0.00	-	17.0
Fire Creek	GPM1	0.20	5.04	0.00	0.20	0.00	0.40	0.20	0.00	0.00	0.00	3.5	13.5
Fire Creek	GPM2	0.00	7.61	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	3.5	13
Fish Creek	GPM1	5.13	4.12	0.00	0.99	0.00	0.14	0.00	0.00	0.00	0.00	1.4	13
Fish Creek	GPM2	0.00	5.07	0.00	0.79	0.00	0.12	0.00	0.00	0.00	0.00	2	13.5
Ltl Clearwater River	1 (Little Clearwater)	0.00	0.59	0.00	11.83	0.00	4.14	0.59	0.00	1.18	0.00	-	16.0
Ltl Clearwater River	2 (Little Clearwater)	0.00	0.00	0.00	1.48	0.00	1.15	0.33	0.00	0.00	0.00	-	16.0

Table 20. Continued.

		Density											
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Hatchery Steelhead**	**Chinook Salmon**	**Hatchery Chinook**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Cut/Steel Hybrid**	**Visibility (m)**	**Temp (C)**
Moose Creek	1	0.00	6.87	0.00	1.08	0.00	1.84	0.00	0.00	4.55	0.00	-	21.0
NF Moose Creek	NF Moose	0.00	0.05	0.00	1.49	0.00	1.78	0.00	0.00	0.87	0.00	-	18.0
Old Man Creek	GPM1	0.00	3.90	0.00	0.00	0.00	0.18	0.09	0.00	0.09	0.00	3.4	14
Red River	1 CNTL1	0.00	1.54	0.00	48.12	0.00	0.00	0.00	0.38	0.96	0.00	2.4	9.0
Red River	1-CNTL2	0.00	6.64	0.00	2.49	0.00	0.00	0.28	0.28	0.28	0.00	1.3	12.0
Red River	2-CNTL2	0.00	0.25	0.00	3.27	0.00	1.39	0.00	0.00	0.00	0.00	1.3	12.0
Red River	2-Treat 2	0.00	1.38	0.00	3.57	0.00	0.23	0.00	0.23	0.12	0.00	2.2	13.0
Red River	Shissler CR	0.00	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	10.0
Relief Creek	1-a (Relief Creek)	0.00	4.61	0.00	0.35	0.00	7.44	0.00	0.00	0.00	0.00	-	10.5
Running Creek	1	0.00	0.59	0.00	0.00	0.00	0.20	0.00	0.00	0.20	0.00	-	-
Running Creek	2	0.00	3.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	19.0
SF Clearwater River	103.2km	0.00	1.73	0.00	24.05	0.00	0.00	0.00	0.00	1.59	0.00	1.8	11.5
SF Clearwater River	83.9km	0.00	0.56	0.00	0.52	0.00	0.04	0.00	0.00	0.19	0.00	1.5	12.0
SF Clearwater River	88.7km	0.00	3.97	0.00	1.83	0.00	0.00	0.00	0.00	0.08	0.00	1.8	11.0
SF Clearwater River	93.9km	0.00	0.42	0.00	1.19	0.00	0.00	0.00	0.00	0.00	0.00	1.5	11.5
SF Clearwater River	98.7km	0.00	1.73	0.00	4.78	0.00	0.00	0.00	0.00	0.13	0.00	1.5	12.0
Selway River	Bad Luck Creek	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.93	0.00	-	17.0
Selway River	Below Tango	0.00	0.11	0.00	0.02	0.00	0.39	0.00	0.00	0.70	0.00	-	20.0
Selway River	Beaver Point	0.00	0.10	0.00	54.58	0.00	1.02	0.00	0.00	0.87	0.00	-	16.0
Selway River	Big Bend	0.00	0.06	0.00	0.00	0.00	0.55	0.00	0.00	1.62	0.00	-	16.0
Selway River	Hells Half Acre	0.00	0.21	0.00	4.46	0.00	2.06	0.21	0.00	0.21	0.00	-	13.0
Selway River	Little Clearwater	0.00	0.34	0.00	19.65	0.00	2.30	0.06	0.00	0.98	0.00	-	17.5
Selway River	Magruder X-ing	0.00	0.04	0.00	19.21	0.00	0.81	0.00	0.00	0.29	0.00	-	16.0
Selway River	North Star Ranch	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00	2.19	0.00	-	17.0
Split Creek	GPM1	7.58	7.74	0.00	0.34	0.00	0.17	0.00	0.00	0.00	0.00	3.6	13
Split Creek	GPM2	1.91	11.98	0.00	0.00	0.00	1.09	0.00	0.00	0.00	0.00	3.6	14
Three Links Creek	1	0.00	0.98	0.00	3.51	0.00	5.46	0.00	0.00	0.00	0.00	-	14.0
WF Crooked River	H-WF2	0.00	0.41	0.00	0.00	0.00	4.27	0.00	0.00	0.00	0.00	4.0	10.0
White Cap Creek	1 (White Cap)	0.00	0.00	0.00	15.79	0.00	0.62	0.00	0.00	1.39	0.00	-	19.0
White Cap Creek	2 (White Cap)	0.00	0.00	0.00	0.37	0.00	0.12	0.00	0.00	0.12	0.00	-	18.0
White Cap Creek	3 (White Cap)	0.00	0.12	0.00	8.95	0.00	0.98	0.06	0.00	0.17	0.00	-	17.0

Table 21. Densities (fish/100m^2) of salmonids observed at core and non-core trend transects snorkeled in the Salmon River steelhead major population group during 2010. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout.

		Density									
Stream	Site	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/ Bull Hybrid	Visibility (m)	Temp (C)
Alturas Lake Creek	2B	0.16	0.00	5.30	0.00	0.00	1.25	0.94	0.00	2.7	18.0
Bear Valley Creek	A	2.53	1.07	16.11	0.06	0.00	0.62	0.62	0.00	1.1	16.5
Bear Valley Creek	B	0.67	0.09	2.22	0.00	0.00	0.54	1.24	0.00	1.6	17.0
Beaver Creek	3/B	0.00	1.15	1.81	0.05	0.16	0.66	0.05	0.00	4.0	16.0
Big Creek	Near Ford	0.17	0.67	55.12	0.00	0.58	2.83	0.17	0.00	2.8	12.0
Big Springs Creek	BSC Bridge	0.00	2.09	0.00	0.00	0.00	0.15	0.00	0.00	1.9	11.0
Boulder Creek	1	0.00	0.87	0.00	0.00	0.00	3.49	0.00	0.00	2.9	10.0
Boulder Creek	2	0.25	3.02	0.00	0.00	0.00	0.63	0.00	0.25	-	10.5
Boulder Creek	3	8.44	11.53	2.11	0.00	0.16	0.00	0.00	0.00	2.4	10.5
Boulder Creek	5	0.00	10.23	1.10	0.00	0.00	0.00	0.00	0.00	1.4	10.0
Camas Creek	L1-MOUTH	0.00	0.91	0.00	1.97	0.15	0.00	4.24	0.00	2.2	15.0
Camas Creek	Upper	0.00	7.06	0.00	1.54	0.00	0.00	1.84	0.00	2.2	15.0
Cape Horn Creek	1/A (Upper)	0.00	0.32	7.56	0.00	0.00	0.97	0.00	0.00	3.6	9.0
Cape Horn Creek	2/B (Lower)	0.00	0.00	64.11	0.00	0.00	0.13	0.00	0.00	3.8	10.0
EF SF Salmon River	3	0.00	0.88	0.00	0.00	0.14	0.00	0.05	0.00	1.3	13.0
EF SF Salmon River	6	0.08	0.23	6.33	0.17	0.00	0.04	2.38	0.00	1.8	11.0
EF SF Salmon River	7	0.00	7.06	0.32	1.12	0.16	0.00	0.64	0.00	2.2	12.0
EF SF Salmon River	Sugar Cr	0.82	0.32	0.00	0.00	0.50	0.00	0.09	0.00	2	13.0
Elk Creek	1A	0.00	0.75	29.70	0.00	0.00	0.33	3.59	0.08	2	14.0
Elk Creek	1B	0.00	0.39	16.84	0.00	0.00	0.12	0.78	0.00	2.1	16.0
Elk Creek	2A	0.00	0.00	0.00	0.00	0.00	0.38	5.44	0.00	2.5	11.0
Elk Creek	2B	0.10	0.20	26.77	0.00	0.00	0.00	0.70	0.00	2.2	16.0
Hannah Slough	UPS Garden Cr	0.00	0.22	76.98	0.00	0.00	0.00	0.00	0.00	1.7	16.0
Hazard	HAZ1	0.00	8.36	0.00	0.00	0.10	0.00	0.10	0.05	1.9	14.0
Indian Creek	Lower	0.00	0.14	0.55	1.37	0.00	0.00	0.55	0.00	2.4	19.0
Indian Creek	Upper	0.00	1.35	0.77	1.92	0.00	0.00	1.15	0.00	2.6	19.0
Johnson Creek	L2	0.57	9.26	14.95	0.06	0.06	0.00	0.19	0.00	2.1	16.0
Johnson Creek	L3	1.26	8.36	26.86	0.19	0.00	0.09	0.51	0.00	1.6	13.5
Johnson Creek	M1	0.00	0.00	0.00	3.21	0.00	0.00	0.00	0.00	1.8	12.0
Johnson Creek	M2	0.00	0.12	0.00	0.00	0.00	3.40	0.00	0.00	2	11.0
Johnson Creek	M3	0.00	0.03	0.00	0.00	0.00	1.02	0.00	0.00	1.2	10.0
Johnson Creek	PW1A	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	1.1	10.0
Johnson Creek	PW3A	0.00	6.26	0.08	0.00	0.00	0.17	0.00	0.00	-	11.5
Johnson Creek	PW3B	0.00	4.30	0.00	0.00	0.05	0.00	0.05	0.00	1.6	14.5
Lake Creek	Burgdorf	0.16	0.00	6.59	0.00	0.00	0.00	0.00	0.00	2.2	12.0
Lake Creek	Willow Cr	0.00	0.00	9.24	0.00	0.00	0.00	0.00	0.00	1.5	13.0
Lemhi River	1/LEM3A	0.09	6.29	0.77	0.00	0.00	0.00	1.36	0.00	1.8	10.0
Lemhi River	LEM2/B	0.00	4.63	1.13	0.00	0.00	0.47	0.00	0.00	2.4	10.0
Lick Creek	L1	0.93	12.92	2.15	0.14	0.00	0.14	0.14	0.00	2.8	15.0
Little Salmon River	1	0.39	1.43	0.13	0.00	0.00	0.00	0.00	0.00	1.2	14.0
Little Salmon River	2	0.00	3.00	3.00	0.00	0.00	0.00	0.17	0.00	1.3	16.5

Table 21. Continued.

Stream	Site	Density: Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/ Bull Hybrid	Visibility (m)	Temp (C)
Marble Creek	L1	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	2.6	12.0
MF Salmon River	Airstrip	0.00	0.60	0.26	0.43	0.00	0.00	0.09	0.00	2.9	19.0
MF Salmon River	Bernard Airstrip	0.00	0.08	0.00	0.08	0.00	0.00	0.16	0.00	2.9	19.0
MF Salmon River	BIG-CR-BR	0.00	0.00	0.00	0.68	0.00	0.00	0.16	0.00	2.6	16.0
MF Salmon River	Boundary	0.00	0.26	1.03	1.41	0.00	0.00	1.92	0.00	3.2	16.0
MF Salmon River	CLIFPL	0.03	0.00	0.00	0.26	0.00	0.00	0.10	0.00	2.6	18.0
MF Salmon River	Cougar	0.00	0.00	0.00	0.19	0.00	0.00	1.30	0.00	2.7	19.0
MF Salmon River	Elkhorn	0.00	0.00	0.00	1.65	0.00	0.00	0.25	0.00	2.9	15.0
MF Salmon River	Flying-B	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00	2.9	17.0
MF Salmon River	Goat Pool	0.00	0.00	0.00	0.60	0.00	0.00	0.15	0.00	2.5	16.0
MF Salmon River	Goat Run	0.00	0.00	0.00	0.39	0.00	0.00	0.16	0.00	2.6	17.0
MF Salmon River	GRDLHole	0.00	0.14	0.82	2.12	0.00	0.00	0.14	0.00	2.9	16.0
MF Salmon River	Greyhound	0.00	0.00	0.81	0.57	0.00	0.00	0.41	0.00	3.1	17.0
MF Salmon River	HANPOL	0.00	0.00	0.00	3.04	0.00	0.00	0.09	0.00	2.4	16.0
MF Salmon River	HOSPPL	0.00	0.00	0.00	0.12	0.00	0.00	0.12	0.00	2.7	18.0
MF Salmon River	HOSPRUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	18.0
MF Salmon River	Indian	0.00	0.00	0.00	1.69	0.00	0.00	1.08	0.00	2.7	18.0
MF Salmon River	LICRGS	0.00	0.00	0.00	1.38	0.00	0.00	1.75	0.00	3.2	15.0
MF Salmon River	Ljackass	0.00	0.00	0.51	0.44	0.00	0.00	0.07	0.00	3.1	16.0
MF Salmon River	Love Bar	1.54	0.00	0.00	1.25	0.00	0.00	0.10	0.00	2.6	17.0
MF Salmon River	Mahoney Camp	0.00	0.00	0.00	4.81	0.00	0.00	0.37	0.00	2.7	19.0
MF Salmon River	Marble Pool	0.00	0.06	0.00	2.85	0.06	0.00	1.34	0.00	2.9	14.0
MF Salmon River	Otter Bar	0.00	0.00	0.00	0.36	0.00	0.00	0.29	0.00	2.4	16.0
MF Salmon River	Pungo	0.00	0.00	0.12	0.87	0.12	0.00	0.62	0.00	2.6	16.0
MF Salmon River	Rapid-R	0.00	0.34	2.59	2.93	0.00	0.00	1.35	0.00	3.0	12.0
MF Salmon River	Rock IS	0.00	0.07	0.00	2.40	0.00	0.00	0.85	0.00	2.9	17.0
MF Salmon River	Sheepeater	0.00	0.09	0.54	0.54	0.00	0.00	0.36	0.00	2.7	17.0
MF Salmon River	Ship IS	0.00	0.00	0.00	0.92	0.00	0.00	0.46	0.00	2.6	18.0
MF Salmon River	Survey	0.00	0.14	0.00	0.97	0.00	0.00	0.14	0.00	2.4	19.0
MF Salmon River	Tappan Pool	0.00	0.00	0.65	0.94	0.00	0.00	0.24	0.00	3.1	18.0
MF Salmon River	Velvet	0.00	2.54	0.00	5.71	0.00	0.00	0.00	0.00	3.2	12.5
MF Salmon River	WCPB	0.00	0.00	0.00	0.63	0.00	0.00	0.23	0.00	2.9	17.0
MF Salmon River	WHITEYCX	0.00	0.08	0.00	4.48	0.00	0.00	1.35	0.00	2.9	19.0
Monumental Cr	MON1	0.00	0.19	0.00	3.35	0.00	0.00	0.00	0.00	3.7	11.0
Monumental Cr	MON2	0.00	6.53	0.00	1.99	0.00	0.00	0.00	0.00	1.8	13.0
Monumental Cr	MON3	0.00	5.28	0.00	1.83	0.00	0.00	0.00	0.00	2.6	13.0
Monumental Cr	MON5	0.00	4.94	14.98	0.31	0.00	0.00	0.15	0.00	2.6	15.0
NF Salmon River	Dahlonega	4.64	5.84	2.40	0.07	0.15	0.00	0.22	0.00	2.6	11.0
NF Salmon River	Hughes	4.47	4.47	2.23	0.00	0.00	0.30	0.82	0.00	2.7	10.0
Pahsimeroi River	DWTN Lane	0.70	10.15	12.64	0.00	0.00	1.09	5.08	0.00	1.7	14.0
Pahsimeroi River	Ponds	2.17	6.52	0.38	0.00	0.00	0.89	2.94	0.00	1.7	13.0
Pahsimeroi River	WEIR DS	0.12	6.49	6.86	0.00	0.00	0.00	5.14	0.00	1.3	13.0
Panther Creek	PC10	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	1.2	9.0
Panther Creek	PC9	0.00	4.23	1.54	0.00	0.19	0.58	0.19	0.00	1.0	13.0
Pistol Creek	Lower	0.00	0.33	0.00	5.62	0.00	0.00	1.32	0.00	2.7	16.0

Table 21. Continued.

Stream	Site	Density: Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/ Bull Hybrid	Visibility (m)	Temp (C)
Pistol Creek	Upper	0.00	0.00	0.69	1.16	0.00	0.00	1.16	0.00	2.7	16.0
Rapid River	Castle Cr	0.13	9.93	0.00	0.00	1.29	0.00	0.00	0.00	2.2	9.0
Rapid River	Cliff Hang	0.00	9.09	0.00	0.00	0.20	0.00	0.00	0.00	2.6	12.0
Rapid River	Copper Cr	0.00	3.41	0.00	0.00	0.63	0.00	0.00	0.00	2.6	9.5
Rapid River	Cora Cliff	0.60	9.71	0.00	0.00	1.00	0.00	0.00	0.00	2.9	10.0
Rapid River	GPM 4	0.11	3.75	0.00	0.00	0.32	0.00	0.00	0.00	3.3	11.0
Rapid River	Paradise	0.00	3.00	0.00	0.00	3.12	0.00	0.00	0.00	2.4	9.0
Redfish Lake Creek	Weir DS	0.09	0.09	0.43	0.00	0.19	0.05	0.33	0.00	4.6	16.5
Rock Creek	M1	15.22	0.00	13.29	0.00	0.00	0.28	0.00	0.00	1.7	10.0
Sand Creek	M2	0.47	0.00	0.00	0.00	0.00	0.47	0.00	0.00	2.1	9.0
Secesh River	Grouse	0.00	0.50	3.88	0.00	0.00	0.00	0.20	0.00	2.2	10.0
Secesh River	Long Gulch	0.05	0.00	25.31	0.00	0.00	0.00	0.09	0.00	2.2	10.0
Slate Creek	1	0.43	2.23	1.06	0.00	0.00	0.00	0.32	0.00	1.4	14.0
Slate Creek	2	0.62	4.57	0.00	0.00	0.00	0.00	0.00	0.00	1.2	16.0
Slate Creek	3	0.00	2.96	0.00	0.00	0.00	0.00	0.17	0.00	1.4	13.0
Slate Creek	4	0.00	3.69	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Slate Creek	6	0.16	2.25	0.00	0.00	0.00	0.00	0.00	0.00	1.8	10.0
SF Salmon River	5	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	1.5	10.5
SF Salmon River	7	0.38	3.42	6.39	0.00	0.00	0.00	0.76	0.00	2.9	16.0
SF Salmon River	14	0.15	0.05	3.40	0.00	0.00	0.05	4.33	0.00	2.4	17.0
SF Salmon River	16	0.11	1.75	4.92	0.14	0.00	0.00	1.21	0.00	2	18.5
SF Salmon River	STOLLE1	0.24	0.00	5.62	0.00	0.00	0.00	1.13	0.00	1.4	13.0
SF Salmon River	STOLLE2	1.43	0.00	0.50	0.00	0.00	0.00	0.00	0.00	1.1	11.5
SF White Bird Creek	SF-#2	4.70	5.28	0.00	0.00	0.00	0.00	0.00	0.00	1.2	16.0
SF White Bird Creek	SF-#3	3.50	7.81	0.00	0.00	0.00	0.00	0.00	0.00	1.7	17.0
WF Monumental Cr	MON4	0.00	5.20	9.47	0.00	0.00	0.00	0.74	0.00	2.3	11.0
White Bird Creek	1	1.71	8.30	0.00	0.00	0.00	0.00	0.00	0.00	1.5	14.5

Table 22. Densities (fish/100m^2) of salmonids observed at core and non-core trend transects snorkeled in the Clearwater River steelhead major population group during 2010. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout.

		Density									
Stream	**Site**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Hatchery Chinook**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
American River	1-2.25U	0.00	0.36	24.70	0.00	0.89	0.00	1.42	0.36	1.6	14.5
American River	1-2.65U	0.00	0.00	53.96	0.00	0.89	0.00	0.89	0.45	1.6	13.0
American River	1-Gravel Pit	0.00	0.00	119.24	0.00	1.21	0.00	1.21	4.03	1.8	11.0
American River	2-1	0.00	0.61	31.75	0.31	1.53	0.00	0.00	2.44	3.0	15.0
American River	2-1/8MABVEFK	0.00	0.00	76.97	0.00	0.00	0.00	1.01	0.00	1.6	13.0
American River	2-Flatiron Ridge	0.00	1.78	52.38	0.00	0.44	0.44	0.00	1.78	3.6	14.0
American River	3-.5mi below Boxsing	6.93	1.73	101.13	0.00	0.58	1.16	1.73	3.47	3.2	14.0
American River	3-2	0.00	0.46	40.34	0.00	0.00	0.23	0.34	0.00	2.2	10.0
American River	3-Buffalo Pit	0.00	1.00	27.47	0.00	1.19	0.00	0.20	3.19	1.5	11.0
Bear Creek	1	0.24	1.22	0.00	0.00	1.83	0.00	0.00	3.65	-	-
Bear Creek	1	0.24	1.22	0.00	0.00	1.83	0.00	0.00	3.65	-	-
Brushy Fork	3-1	0.00	6.30	0.52	0.00	0.00	0.00	0.00	0.52	4.2	12.0
Colt Killed Creek	LWRMonitor	0.00	1.23	0.57	0.00	0.63	0.03	0.00	0.06	2.1	12.0
Crooked Fork	1-2A	0.00	3.32	0.00	0.00	6.08	0.00	0.00	0.00	3.6	9.0
Crooked Fork	2-4A	0.00	1.26	0.00	0.00	2.10	0.00	0.00	0.00	4.5	9.5
Crooked Fork	3-1	19.92	0.60	0.07	0.00	0.13	0.00	0.00	0.47	4.2	15.0
Crooked Fork	4-1B	0.00	5.36	0.34	0.00	1.41	0.00	0.00	0.28	3.0	16.0
Crooked River	2-Control1	0.00	2.02	1.54	0.00	0.12	0.12	0.00	0.24	2.1	12.0
Crooked River	2-Control2	0.00	4.30	4.63	0.00	0.33	0.00	0.00	0.33	1.7	12.0
Crooked River	2-Treat2	0.00	0.36	7.20	0.00	0.18	0.00	0.09	0.09	3.0	12.0
Crooked River	3-Natural1	0.00	0.63	0.00	0.00	0.00	0.00	0.16	0.16	1.3	13.5
Crooked River	3-Natural3	0.00	0.47	0.78	0.00	0.23	0.00	0.00	0.39	2.2	12.0
Crooked River	4-Meander1	0.00	1.11	0.31	0.00	0.04	0.00	0.27	0.62	2.3	15.0
Crooked River	4-Meander2	0.00	0.35	0.26	0.00	0.43	0.00	0.00	0.09	1.7	12.5
Crooked River	C-CAN3	0.00	1.12	8.52	0.00	0.14	0.00	0.00	1.54	1.6	14.0
Deep Creek	Cactus	0.00	3.38	1.27	0.00	4.86	0.00	0.00	0.00	-	-
Deep Creek	Scimitar	0.00	2.63	0.24	0.00	2.39	0.00	0.00	0.00	-	-
EF Crooked River	H-EF2	0.00	0.00	0.00	0.00	2.86	0.00	0.00	0.00	1.7	8.0
EF Moose Creek	3	0.00	1.83	0.06	0.00	0.82	0.00	0.00	0.19	-	-
EF Potlatch River	Bloom Meadow 1	0.00	0.22	0.00	0.00	0.00	0.00	0.44	0.00	1.1	12.0
EF Potlatch River	Bloom Meadow 2	0.00	0.16	0.00	0.00	0.00	0.00	0.16	0.00	0.8	11.0
EF Potlatch River	Fry Meadows	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	1.2	14.0
EF Potlatch River	PF1	0.00	2.40	0.00	0.00	0.00	0.00	4.46	0.00	2.2	16.0
EF Potlatch River	PF2	0.00	8.86	0.00	0.00	0.00	0.00	3.80	0.00	1.3	14.0
EF Potlatch River	PF3	1.00	3.51	0.00	0.00	0.00	0.00	3.01	0.00	1.4	14.0
EF Potlatch River	PF4	0.00	6.09	0.00	0.00	0.00	0.00	3.88	0.00	1.9	10.0
EF Potlatch River	PF5	0.00	0.89	0.00	0.00	0.00	0.00	0.89	0.00	1.1	10.0
EF Potlatch River	PF6	0.00	3.02	0.00	0.00	0.00	0.00	5.38	0.00	1.4	10.5
EF Potlatch River	PF7	0.00	1.03	0.00	0.00	0.00	0.00	1.03	0.00	2.2	5.0
EF Potlatch River	PF9	0.00	4.33	0.00	0.00	0.00	0.00	2.16	0.00	1.3	9.0
Fire Creek	1	0.00	4.28	0.00	0.00	2.24	0.00	0.00	0.00	2.3	11.5
Fire Creek	2	0.00	4.18	0.00	0.00	2.30	0.00	0.00	0.00	3.2	13.0

Table 22. Continued.

Stream	Site	Density: Trout Fry	Steelhead	Chinook Salmon	Hatchery Chinook	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Visibility (m)	Temp (C)
Fish Creek	1	2.28	11.38	0.13	0.00	1.71	0.00	0.00	0.00	3.4	15.0
Fish Creek	2	2.10	13.67	0.19	0.00	1.24	0.12	0.00	0.00	1.9	13.0
Hopeful Creek	1-BOOGIEDN	0.00	0.43	0.00	0.00	5.34	0.21	0.00	0.00	5.0	11.0
Johns Creek	1-1	0.32	3.82	0.00	0.00	1.27	0.00	0.00	0.32	2.7	-
Johns Creek	1-2	0.15	2.42	0.00	0.00	0.76	0.00	0.00	0.00	2.7	-
Little Clearwater R	1	0.00	1.46	2.19	0.00	2.44	0.73	0.00	0.24	-	-
Little Clearwater R	2	0.00	0.67	0.50	0.00	1.85	0.17	0.00	0.17	-	-
Marten Creek	1	0.00	0.00	0.00	0.00	13.64	0.00	0.00	0.00	-	-
Moose Creek	1	0.00	4.62	0.29	0.00	1.15	0.00	0.00	2.88	-	-
Old Man Creek	1	0.00	3.33	0.00	0.00	1.89	0.11	0.11	0.44	2.6	15.0
Old Man Creek	1 (2nd time)	0.00	0.99	0.44	0.00	3.63	0.00	0.11	0.55	4.2	15.0
Red River	1-CNTL 1	8.90	0.00	5.56	0.00	0.00	0.00	3.62	2.78	2.1	11.0
Red River	1-CNTL 2	3.44	0.00	15.75	0.00	0.00	0.00	3.72	0.00	2.4	13.0
Red River	2-CNTL 2	0.00	0.55	1.93	0.00	0.28	0.00	0.55	0.00	1.8	11.0
Red River	2-TREAT 2	0.00	0.66	0.99	0.00	0.33	0.00	0.22	0.33	1.8	10.0
Red River	3-BELOW WEIR	0.37	2.75	40.18	0.00	2.02	0.00	0.18	1.47	2.8	13.0
Red River	3-OLD BRIDGE	0.00	0.73	29.57	0.00	0.41	0.00	0.00	0.49	1.6	13.0
Red River	4-CNTL 2	0.00	0.32	12.99	0.00	0.05	0.00	0.05	0.09	1.6	12.0
Red River	5-CNTL 2	0.18	1.42	0.36	0.00	0.00	0.00	0.00	0.27	1.6	14.0
Red River	5-TREAT 2	0.18	0.00	2.45	0.00	0.00	0.00	0.00	0.25	1.6	14.0
Red River	6-CSUP 3	0.00	0.18	16.30	0.00	0.00	0.00	0.36	0.54	1.2	13.5
Red River	6-CSUP 5	0.00	1.00	11.57	0.00	0.14	0.00	0.00	0.14	1.2	13.5
Relief Creek	1-1A	0.00	0.63	0.00	0.00	3.75	0.00	0.00	0.00	1.0	12.0
Running Creek	1	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.49	-	-
Running Creek	1	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.49	-	-
Running Creek	2	0.00	0.13	0.13	0.00	0.40	0.00	0.00	0.00	-	-
Running Creek	2	0.00	0.13	0.13	0.00	0.40	0.00	0.00	0.00	-	-
Selway River	Badluck Cr	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.59	-	-
Selway River	Beaver Pt	0.00	0.05	3.80	0.00	0.15	0.00	0.00	0.30	-	-
Selway River	big bend	0.00	0.00	0.03	0.00	0.33	0.00	0.00	1.23	-	-
Selway River	LITTLE-CW	0.00	0.53	0.00	0.00	1.17	0.00	0.00	1.28	-	-
Selway River	MAG-XING	0.00	0.00	1.63	0.00	0.04	0.00	0.00	0.04	-	-
Selway River	Northstar	0.00	0.07	0.00	0.00	1.90	0.00	0.00	7.84	-	-
Selway River	Osprey Is	0.08	0.06	0.00	0.00	0.82	0.00	0.00	1.17	-	-
Split Creek	1	0.00	5.81	0.00	0.00	2.83	0.00	0.00	0.70	3.5	12.0
Split Creek	1 (2nd time)	0.00	11.52	0.00	0.00	2.62	0.00	0.00	0.00	2.8	12.5
Split Creek	2	0.00	8.06	0.00	0.00	3.42	0.00	0.00	0.00	2.8	14.0
Split Creek	2 (2nd time)	0.00	5.33	0.00	0.00	6.55	0.00	0.00	0.00	3.0	13.0
Tenmile Creek	1	0.00	0.74	0.00	0.00	0.74	0.00	0.00	0.12	3.1	10.0
Tenmile Creek	2	0.00	0.90	0.00	0.00	1.19	0.00	0.00	0.00	3.1	10.0
Three Links Creek	1	0.00	7.59	0.00	0.00	25.05	0.00	0.00	0.00	-	-
WF Crooked River	H-WF2	0.00	0.20	0.00	0.00	0.81	0.00	0.00	0.00	1.7	8.0
White Cap Creek	3-1	0.00	1.27	0.16	0.00	0.32	0.00	0.00	2.38	-	-
White Cap Creek	3-2	0.00	0.08	0.00	0.00	0.08	0.00	0.00	0.17	-	-
White Cap Creek	3-3	0.00	0.19	0.29	0.00	1.65	0.00	0.00	0.19	-	-

Table 23. Steelhead detection probabilities from mark-resight studies during 2009. Fish were marked with an upper caudal clip in the main transect and resighted during a subsequent snorkel survey. Asterisks indicate that juvenile cutthroat trout were included in the number marked.

Stream	**Transect**	**Number marked**	**Number resighted**	**Efficiency (%)**	**Visibility (m)**	**Temp (C)**
Sable Creek	154690	7	2	28.6	2.6	11.0
Butte Creek	105538	11*	7	63.6	3.0	11.0
Meadow Creek	121922	26	8	30.8	3.0	14.0
O'Hara Creek	104226	20	17	85.0	2.0	12.0
Brushy Fork	Bridge Resight	20	14	70.0	3.0	18.0
Crooked Fork	28481	22*	14	63.6	3.0	14.0
Crooked River	Meander 1	21	11	52.4	2.0	13.0
Crooked River	Natural 3	28	2	7.1	3.0	11.0
Panther Creek	Below PC-9	10	4	40.0	1.0	12.0
Squaw Creek	N 45.4468, W 114.21517	17*	11	64.7	2.6	9.0
Twin Creek	NF Salmon confluence	12*	5	41.7	2.7	9.0
N Fork Salmon River	Hughes	14*	12	85.7	2.4	12.0
N Fork Salmon River	Last Hwy 28N access	13*	4	30.8	3.9	8.0
Slate Creek	Resight	28	22	78.6	1.9	14.0
Slate Creek	3	30	19	63.3	2.5	13.0
Marsh Creek	Resight 1 in canyon	25	9	36.0	3.6	14.0
Marsh Creek	Resight 2 in canyon	20	3	15.0	3.3	10.5
Rapid River	19346	17	7	41.2	2.9	11.5
Rapid River	62354	11	5	45.5	3.6	11.0
Fish Creek	GPM 1	16	3	18.8	1.4	13.0
Fish Creek	GPM 2	35	2	5.7	2.0	13.5

Table 24. Steelhead detection probabilities from mark-resight studies during 2010. Fish were marked with an upper caudal clip in the main transect and resighted during a subsequent snorkel survey. Asterisks indicate that juvenile cutthroat trout were included in the number marked.

Stream	Site	Number marked	Number resighted	Efficiency (%)	Visibility (m)	Temp (C)
Rapid River	19346	31	17	54.8	2.5	10.0
Rapid River	62354	16*	7	43.8	2.4	13.0
Fish Creek	41666	36*	9	25.0	1.5	14.0
Fish Creek	GPM 2	30*	11	36.7	1.9	13.0
Clear Creek	99-Resight 2010	11	7	63.6	2.6	16.0
Lemhi River	99-Resight 2010	33	23	69.7	1.6	12.0
Brushy Fork	3-1	29	12	41.4	2.5	14.0
Meadow Creek	Resight	16	4	25.0	1.5	12.0
Rhoda Creek	47810	28	2	7.1	0.8	10.5
Rhoda Creek	101314	16	12	75.0	4.0	13.0
EF Potlatch River	136049	33	11	33.3	1.9	15.0
Red River	Upper Red Resight	9	7	77.8	3.2	17.0
Crooked River	4-Meander1	17	5	29.4	2.3	15.0
Relief Creek	1-1A	18	9	50.0	1.0	12.0
Bob's Creek	37745	10	8	80.0	0.8	11.0
NF Moose Creek	NF Moose Resight	17	2	11.8	2.5	15.0
EF Potlatch River	2929	12	6	50.0	1.0	11.5
Crooked River	4-Meander1	14	4	28.6	1.4	8.5
Slate Creek	Slate 2 Resight	18	10	55.6	1.2	16.0
Slate Creek	Slate 4 Resight	24	20	83.3	>1.0	15.0
Secesh River	Resight 1	45	25	55.6	1.6	14.5
Hazard Creek	Haz 1	53	36	67.9	1.9	14.0

Table 25. Candidate hypotheses explaining density dependence observed in smolt production of Snake River spring/summer Chinook salmon populations during 1990-2010.

Hypothesis	Explanation
Marine-derived nutrients	Lack of adult carcasses reduces carrying capacity of infertile spawning streams (Naiman et al. 2002).
Retreat to core areas	Current spawners home to relatively small patches of habitat (Thurow 2000; Isaak and Thurow 2006).
Invasion of predators and competitors	Introduced species and hatchery-produced fish compete with and prey on young salmon (Levin et al. 2002; Weber and Fausch 2003).
Hatchery strays and supplementation fish	Hatchery fish do not spawn as effectively as natural fish and strays or supplementation fish may increase localized density dependence. (Fleming and Gross 1993).
Habitat loss	Reduction of off-channel habitat in spawning and rearing areas (Pollock et al. 2004).
Temperature stress	Global warming and loss of tree cover via forest fires and grazing raise water temperatures at critical times (Flebbe 1997; Schoennagel et al. 2005).
Drought/low flows	High escapements are coincident with drought. Stream flow is critical to juvenile survival in the interior Columbia basin (Arthaud et al. 2004).
Life history diversity	Loss of local adaptations and temporal variations in movement lead to a reduction in occupied habitat and regional productivity (Adkison 1995; Lichatowich and Mobrand 1995).

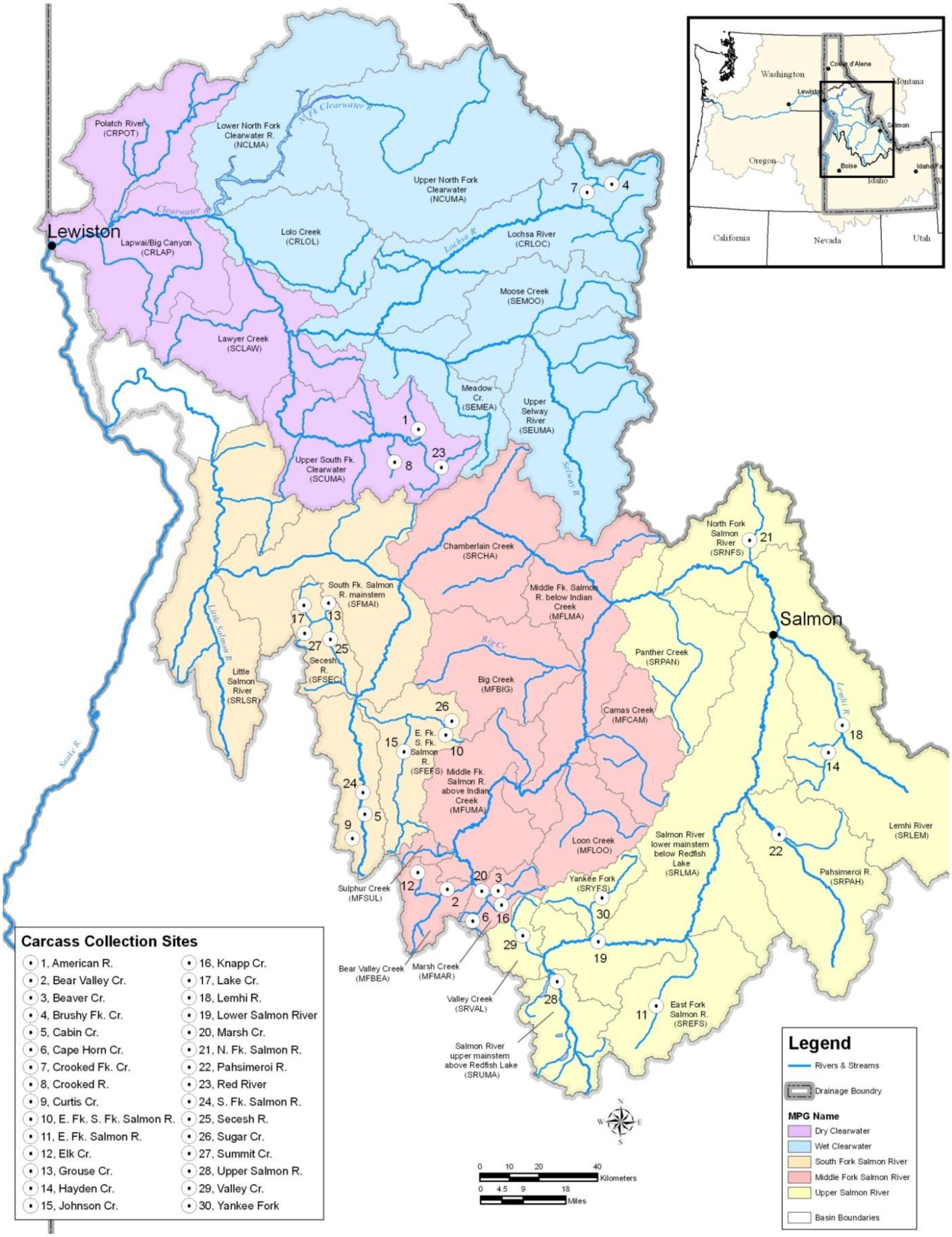

Figure 1. Spawning ground survey locations where wild Chinook salmon carcasses were collected during 2009.

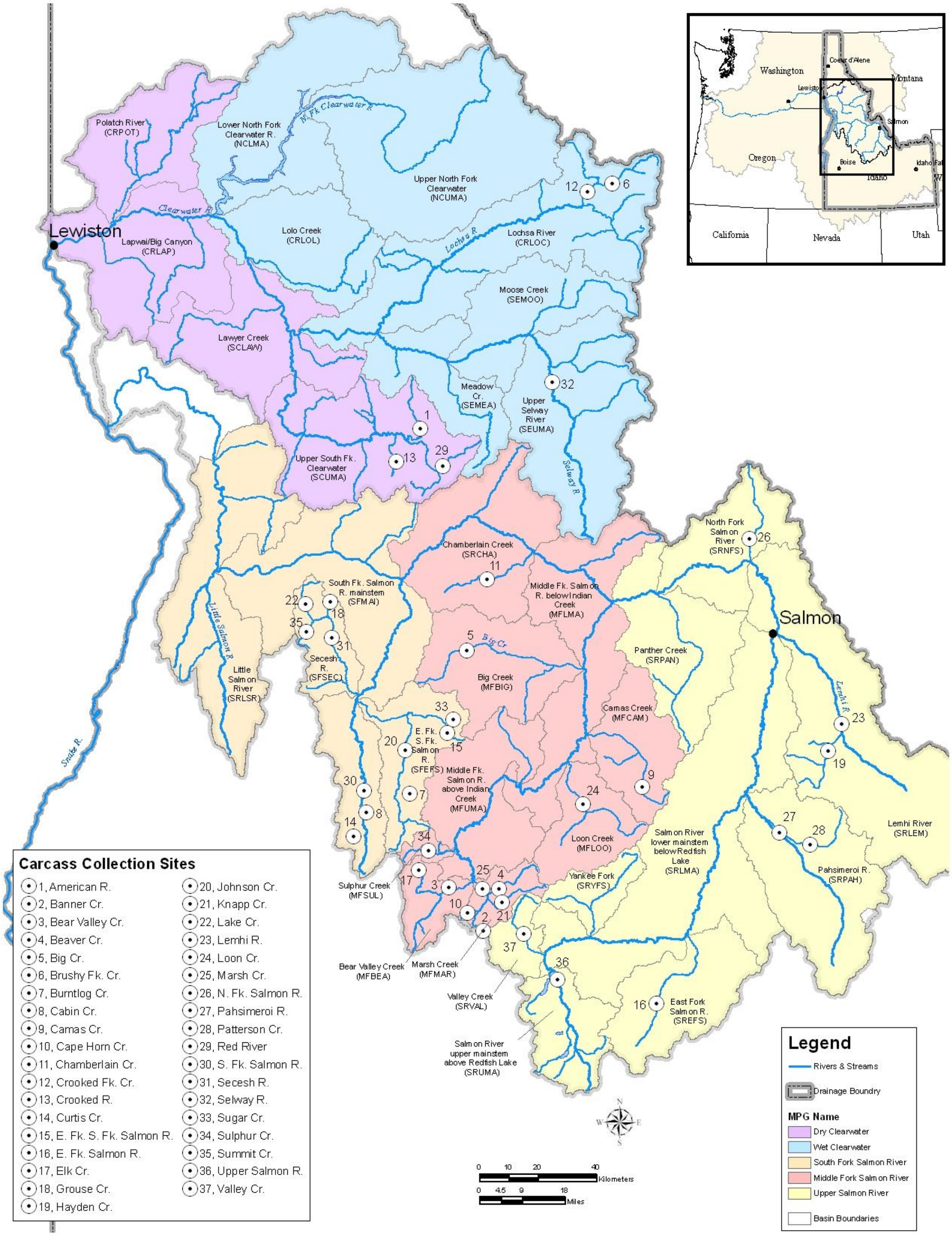

Figure 2. Spawning ground survey locations where wild Chinook salmon carcasses were collected during 2010.

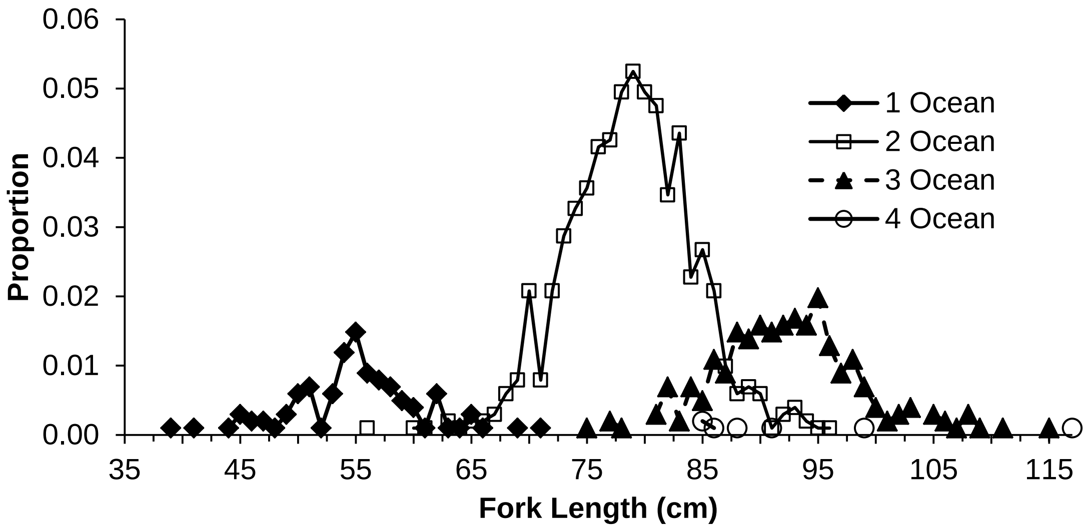

Figure 3. Length distribution by ocean age of wild Chinook salmon carcasses collected on the spawning grounds during 2009. Ages were determined from fin ray analysis (*n* = 1,010).

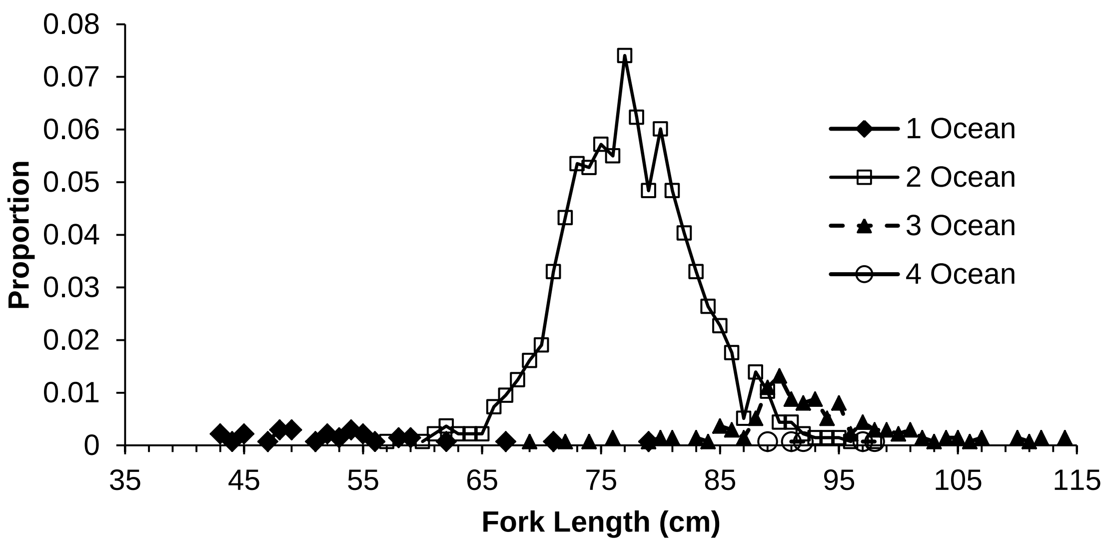

Figure 4. Length distribution by ocean age of wild Chinook salmon carcasses collected on the spawning grounds during 2010. Ages were determined from fin ray analysis (*n* = 1,366).

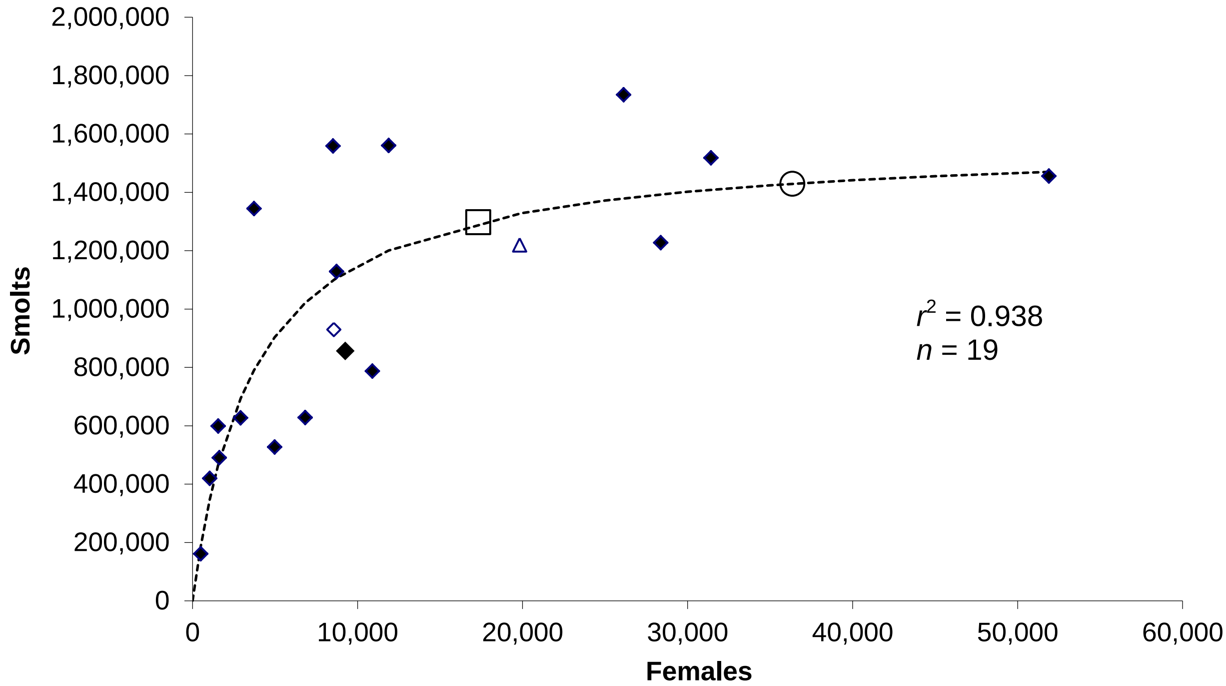

Figure 5. Comparison of observed data (BY1990 to BY2008) to model predictions for the Beverton-Holt model. Observed data are filled diamonds. The BY2007 point is a hollow diamond and the BY2008 point is a hollow triangle. The predictions for BY2009 and BY2010 are the hollow square and hollow circle, respectively.

APPENDIX A: OTHER PROJECT ACCOMPLISHMENTS

Presentations by project personnel

Copeland, T. Life history and salmon conservation. Lecture delivered to University of Idaho Fish Ecology class, October 20, 2009. Moscow, Idaho.

Hatchery supplementation for fishery conservation: diverse policies and applications. Plenary and case study sessions at the 2009 annual meeting of the Idaho Chapter American Fisheries Society. March 4-6, 2009, Boise, Idaho.

Kennedy, P. Idaho natural production monitoring and evaluation. Presented to IDFG's Commission and Director. March 17th, 2010, Nampa, Idaho.

Johnson, J. An explanation and demonstration on how to conduct Chinook salmon carcass surveys. Presented at the annual cooperative spawning ground survey training. August 5th, 2010, McCall, Idaho.

Publications

Copeland, T., and D.A. Venditti. 2009. Contributions of three life history types to smolt production in a Chinook salmon population. Canadian Journal of Fisheries and Aquatic Sciences 66:1658-1665.

Copeland, T., C.C. Kozfkay, J. Johnson, and M.R. Campbell. 2009. Do dead fish tell tales? DNA degradation in Chinook salmon (*Oncorhynchus tshawytscha*) carcasses. Northwest Science 83:140-147.

Data Management

Project efforts with data management begin with training personnel prior to data collection. When sampling in the field during data collection we foster a strict regard for quality assurance. All project data are then monitored for quality control before they are incorporated into databases for long-term storage and reliable dissemination. Database maintenance is primarily directed toward the Standard Stream Survey database, the Biosamples database, the Lower Granite Dam database, and the Spawning Ground Survey database. We also updated the generalized fish distribution for Idaho in StreamNet (www.streamnet.org/). All project data are available via the Idaho Fish and Wildlife Information System (https://fishandgame.idaho.gov/ifwis/portal/).

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